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DISEASES OF FARM ANIMALS.

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V.—NOTIFIABLE DISEASES UNDER THE "MILK AND DAIRY SUPERVISION ACT 1905."

Tuberculosis.

Of all diseases to which animal species are subject, tuberculosis is the most universal in the fullest and widest sense of the term. In man the dreaded "consumption" is a tuberculosis; in cattle the frequently-seen "piner," or "waster," is the victim of the same disease. It affects pigs, horses, and all other kinds of domestic animals, but to a more limited extent than cattle, the incidence of the disease in sheep, goats, donkeys, and dogs being comparatively rare. Fowls and other domesticated birds are especially subject to tuberculosis when placed in an infective environment, and it has even been found to affect fish. The disease is also universal in the sense that no country in the known world is free from it, and no disease affects so large a proportion of living beings. Sir Lyon Playfair, in an address at the opening of the Edinburgh University in 1886, gave utterance to a remark which, more than anything the author has ever otherwise heard, signalized the importance of the disease tuberculosis in its relationship to life. He said: "Of all factors on our present horizon of knowledge, the disease tuberculosis is the only one that can be regarded as reasonably likely to bring about the extermination of species."

Recognising all this, it is not wonderful that more has been written about this disease than about any other. The numerous phases which the study of the disease presents have been specialized on in innumerable volumes, to some or others of which the reader requiring anything more than the barest outline of knowledge of the disease will have to refer; for it cannot be expected that, in a work of this general character, space for anything more than a mere epitome of what is known about the disease can be afforded. The exigencies of space also forbid extended reference to the disease in animals other than cattle; but this is immaterial, seeing that its cause and nature are practically the same in all animals, as are the lesions it produces and its course, progress, and terminations.

Definition.—Tuberculosis is a contagious, infectious, and infective disease, affecting man and nearly all the domesticated animals and birds, between most of which it is intercommunicable; caused by a specific germ (the *bacillus tuberculosis*); and characterized by the formation in various parts of the body of the anatomical lesion—tubercle, which, inflammatory in origin, undergoes various degenerative changes, such as caseation, calcification, and ulceration.

Causation.—Tuberculosis is caused only by the introduction into the system, whether by inhalation, ingestion, or inoculation, of the *bacillus tuberculosis*.

This microbe was discovered to be the essential cause of the disease by Koch, in 1882. It is a rod shaped bacillus, with rounded ends, and very minute, being about 1-12,000th to 1-20,000th of an inch long, and about 1-5th of this broad. Some of the bacilli are slightly curved, like a cucumber, and in others transparent spots, which may be spores, are seen. For detection of the bacillus by the microscope, the specimen containing it is best stained by what is known as the Ziehl-Neelsen process, the details of which may be found in any standard work on Bacteriology. It was for a long time thought that this method of staining differentiated the tubercle bacillus from all others; but later investigations have shown that certain other bacilli can also be stained by the same process. Of these, the leprosy, smegma, and timothy grass bacilli, and others found in cowdung, milk, and butter, are the most important.

The bacillus tuberculosis is non-motile and aerobic—that is, it needs air for its growth. It may be artificially cultivated on solidified blood serum, or on gelatine broth containing glycerine, and kept at a temperature of about blood-heat. On such media it grows slowly, the culture not reaching characteristic perfection for some weeks. Excepting this artificial method of development, the bacilli do not multiply outside a living body. They live outside the body for a long time, and retain their virulence for six months, or longer, in the dried state. As with other pathogenic organisms, they are quickly destroyed when in contact with putrefaction. The bacillus tuberculosis is not destroyed by the action of the digestive juices. Exposure to direct sunlight destroys it in a few hours, and shade daylight in about a fortnight. Boiling destroys it, as also does a moist heat of 170 deg. F. continued for an hour; but it is still infective in underdone cooked meat—that is, meat in which the redness of the juice is retained. It is not killed by freezing, nor does heavy salting do away with its virulence.

The mutability of the bacillus tuberculosis—that is, its capacity to become changed or modified in various ways—is now an important consideration, in that, if such a possibility is conceded, it appears to afford an explanation of the variant effect of the bacillus when removed from its natural habitat or environment. Just as it is known to vary in its shape, size, and other physical characters, so there is abundant evidence, which is set out in many recent works on the subject, that in different animals, and even in the same individual, the bacillus varies considerably in its pathogenesis—*i.e.*, in its power of producing disease. With this borne in mind, and after exhaustive research and consideration, which need not be here detailed, the conclusion may be stated that the tuberculoses of different species are caused by the one bacillus tuberculosis, and that any apparent differences in effect on different animals are merely such as result from the modified environment, and will become less marked, as they do, the longer the opportunity for becoming accustomed to the modification of

environment is continued. In other words, the variant effect in disease-producing potency of the bacillus on different animals is merely a question of slow adaptability or habituation to new conditions. It was doubtless the lack of recognition of this which led to Koch's blundering assertion, in 1901, that human and bovine tuberculosis were caused by different bacilli, the erroneousness of which was overwhelmingly proved by the British Royal Commission appointed to investigate the matter, and by hundreds of private investigators, whose observations and conclusions are so closely packed in the pages of the scientific literature of the time.

AUXILIARY CAUSATION—*Heredity*.—In dealing with heredity as a causative factor in disease production, the question of the hereditary character of tuberculosis was adverted to at some length. It was there stated that, while the disease itself was not transmitted from parent to offspring, the predisposition to it, or a vulnerability of the offspring to the attack of the disease, was so transmitted. The importance even of hereditary predisposition is modified somewhat by the fact that the offspring of tuberculous animals are born into a tuberculous environment, and are therefore quickly exposed to infection, to which their susceptibility to tuberculosis ought, perhaps, to be more largely credited, rather than to hereditary predisposition. Bang's world-famous experiments seem to prove this. He was able to rear perfectly sound cattle from cows far advanced in the disease by the simple precaution of removing the calf, immediately it was dropped, to uninfected surroundings at a distance, feeding it on milk from sound cows, and preventing contact throughout with other than healthy cattle.

Breed.—It is strongly held by some that certain breeds of cattle are more subject to tuberculosis than others; but an extended experience of the disease in widely separated districts forces the conclusion that, other things being equal, the difference in degree of vulnerability of the different cattle breeds is slight, if indeed it exists at all. Heavy milkers of any breed are more prone to attack on account of the continuous drain of milking on their system and constitution, and if one breed is a deeper milking breed than another then the proportion of tuberculosis might be expected to be greater, but this is not a question of breed, but of nutrition. The fact is that the range of experience of most observers is confined to definite districts, and because Shorthorns or Jerseys are found to be more frequently tuberculous than any other breeds in districts where these breeds predominate, an incomplete and erroneous conclusion may be come to. An instance of this may be given. In 1902, it was announced in the *Journal of the Department of Agriculture* that Jerseys were more particularly subject to tuberculosis than other breeds of cattle. The statement was challenged by Jersey breeders, and it turned out that the main basis on which it was made was the fact that by far the largest number of tuberculous cows killed at the kennels of the Melbourne Hunt Club were Jerseys. These kennels are situated in a district in which there were more Jersey cattle to the square mile than in any other area in the Commonwealth, as might be expected from the fact that two of the leading stud Jersey herds of Australia were located in the vicinity.

Environment.—The keeping of cattle in close contact with each other tends to the more rapid spread of the disease through a herd, and consequently the prevalence of the disease is found to be greatest in herds that are confined in byres for a considerable proportion of their time. On this point, and in so far as the spread of the disease in Australia is concerned, it is opportune to reproduce the following remarks by the author in an address before the Australasian Association for the Advancement

of Science, at Brisbane, published in the journal of the Association for 1895:—"It is desired to take this opportunity to publicly correct a false impression that obtains in some quarters to the effect that cattle kept in a semi-wild state in the Australian bush are immune to the disease. Knowing that tuberculosis is to a certain extent a disease of domestication, spreading readily by close cohabitation, a superficial consideration would seem to support such an impression. But experience of the conditions under which the cattle are bred and reared shows that there are factors obtaining in Australia which predispose to the prevalence of the disease just as much as do the close cohabitation and pampered treatment of cattle in byres in the old world. First of all there is an equal vulnerability to the disease inherited, here as in England, from pure-bred and diseased sires and dams, either imported or the progeny of imported stock. Then, although for the most part cattle are never housed, they always, even when in large mobs, have favourite camping-grounds on which they congregate at night, and which become contaminated with infected droppings and discharges. The stagnant waterholes in the vicinity of these camping-grounds may at any time become contaminated, and facilitate the spread of the disease. A third factor in the spread of the disease in the past has been the indiscriminate way in which virus has been obtained to inoculate for the prevention of pleuro-pneumonia. Tuberculous animals are very likely to become affected with pleuro-pneumonia, and stock-owners (thousands of whom inoculate their own cattle) in many cases are as likely to obtain virus from a tuberculous animal as not. Most important of all, however, is the fact that at least 90 per cent. of all the cattle bred in Australia are not slaughtered until they have arrived at or gone far beyond maturity. The females are kept for breeding until eight and nine years old. Bullocks are not slaughtered until at least four years old, the average age being six. When it is remembered that tuberculosis in bovines is mostly a disease of maturity or old age, it will be seen that the opportunities for its spread are very great, as each animal that becomes affected as age increases acts as a fresh centre from which the disease is communicated. Abattoir statistics indorse this, as it is found that the disease is most common by far in bullocks—especially those from Queensland—up to seven, eight, and nine years old, and in old dairy cows."

Age.—The fact that tuberculosis is in cattle a disease of old age for the most part is an important one. It is not found in one-fifth per cent. of heifers, and dairy herds in which the practice of culling cows after the fourth or fifth calving is followed can so be kept practically free from the disease.

Other factors that may act as auxiliary causes of the disease are insufficient or improper food, starvation, too early breeding, and in-breeding, in so far as these impair the constitution, and in fact any of the many conditions referred to in the chapter on Causation of Disease which favour diminished resistance to the invasion of disease.

MODES OF INFECTION.—Without setting forth speculative ideas as to the means whereby the disease may be conveyed to an animal, it may be said that the following modes of infection have been definitely ascertained:—(*a*) The ingestion of milk containing tubercle bacilli, this being a common mode of infection of young animals and of pigs. (*b*) The inhalation of particles or matter (dust) containing tubercle bacilli exhaled or emitted in the discharges of affected animals, and dried by exposure. (*c*) The swallowing of sputum, phlegm, or discharges from affected

animals, as when a feed-box or manger has been contaminated through previous use by a coughing cow.

Recent researches would appear to indicate the likelihood of tubercle bacilli remaining dormant in the system for months, or even years, before a definite tubercle lesion is set up. If this be so, it may be that many cows which only develop tubercle late in life have actually become infected during calfhood.

PREVALENCE.—Until recent years the question of the extent to which the disease prevailed was very much a matter of guesswork. Estimates were mainly based on abattoir statistics, and the variation of these was notorious. It was accounted for largely by the difference in rigidity of inspection. In fact, the percentage of tuberculosis found to exist in different countries was in ratio to the thoroughness with which inspections were carried out. Denmark's high prevalence of 16 per cent. some years ago was testimony to the thoroughness with which every diseased cow was ferreted out. In other countries the estimate of 2 per cent. given under *lay inspection* was increased to 12, 14, and even 26 per cent. on the work being intrusted to trained veterinarians, who did not increase the prevalence of the disease, but found it where it had been previously, either carelessly or ignorantly, overlooked. It was a shock to England to find from the records of examination of all cattle killed under the Pleuro-pneumonia Slaughter Order of 1892 that the percentage prevalence, though varying in different counties (Edinburgh, 5.75 per cent.; Durham, 18.7 per cent.; Midlothian, 20 per cent.; Yorkshire, 22.8 per cent.; and London, 25 per cent.) was so high—the average being over 5 per cent. of all adult cattle in Great Britain and 20 per cent. of all milch cows kept in cities.

In Australia the earliest mention of tuberculosis that the author has come across is in connexion with the *post mortem* examination of pleuro-pneumonia cattle during the first outbreak in 1859. The conditions described by Mr. Miscamble, M.R.C.V.S., in an animal supposed to have recovered from pleuro-pneumonia leaves no doubt that the animal was affected with tubercle. He says: "There were tubercle in several clusters lining both sides of the chest, and in the superior mediastinum a large tumor full of curdled lymph which seemed to have existed for a considerable time, as the walls of the abscess were quite tough." Speaking on the same specimen, Mr. Pottie, M.R.C.V.S., a then recent arrival from Scotland, said—"Besides pleuro-pneumonia there was another disease in them, viz., tuberculosis." (*Argus*, 17th September, 1859.)

Yet the prevalence of the disease was strenuously denied until in 1884 the Board of Inquiry on Tuberculosis in Cattle in Victoria, having had careful records kept at the Melbourne City Abattoirs, reported that "over 7 per cent. of all cattle slaughtered for the meat supply of Melbourne are tuberculous in some degree." Statistics collected by the Board during the inquiry showed that "for the half-year ending December, 1884, of 16,780 cattle slaughtered, 7.1 per cent. were affected," so that the first-mentioned conclusion was not based on scanty numbers. In spite of the revelation of this Board of Inquiry, an almost incomprehensible perversion of facts in regard to the existence of the disease seems to have been persisted in. As late as 1895 the official estimate of the prevalence of tuberculosis in cattle in Victoria was 1 in 300, or .3 per cent.—this in face of the fact that at the Melbourne City Abattoirs during the previous year, 1894, of 17,681 cattle slaughtered during six months, 169 were condemned as unfit for consumption on account of tuberculosis. This is a proportion of 1 in 104.6, practically 1 per cent., and takes into account only those

condemned; not those, always the greater proportion, affected to a degree not considered as rendering the carcasses unfit for human consumption.

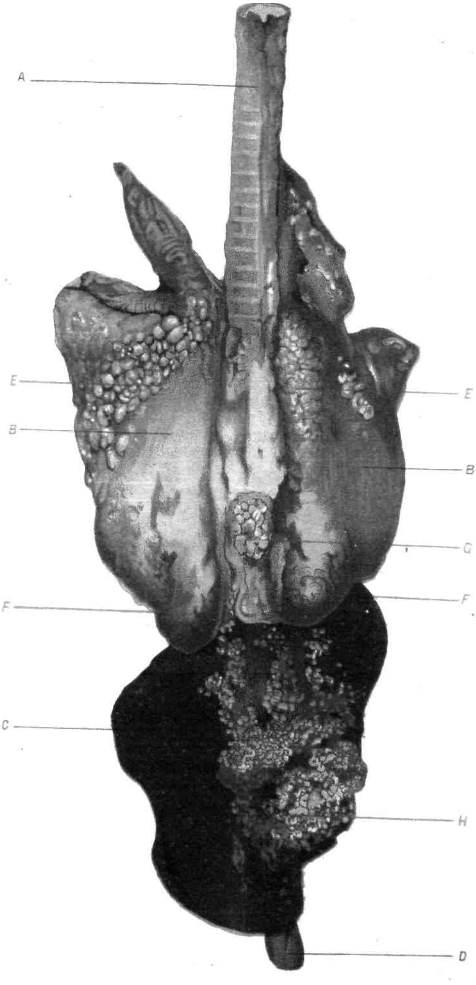
Amongst dairy cattle in Australia reliable statistics are not plentiful. The most reliable are those based on a diagnosis as furnished by the tuberculin test. Such are those published in a report by the author to the Board of Public Health, Victoria, in 1889. A number of milking herds of different breeds were tested in widely-separated parts of the State, and the aggregate totals showed a 9 per cent. prevalence. The report states: "The animals comprising these herds were mostly young cows, or cows in their prime, and above the average of dairy cattle in breeding, in condition, and milking qualities, so that there is likelihood that the proportion of tuberculous animals found in the herds tested, viz., 9 per cent., is not in excess of that for dairy cows in the Colony at large."

Since then, however, the impression must be recorded that there has been a not inconsiderable diminution in the prevalence of the disease. The amount of tuberculosis met with at the abattoirs has certainly diminished, and a corresponding diminution amongst dairy herds may not unreasonably be counted on, so that now it may be asserted that the all-round prevalence does not much exceed 5 per cent. One of the factors accounting for this diminution has been the period of drought through which the continent has passed. During this time it became a question of the "survival of the fittest," and hundreds of weakly and diseased animals were carried off. The efforts of the Stock Departments of the different States in continually seizing and destroying tuberculous cattle and so removing *foci* of infection must also have played a considerable part in diminishing the prevalence of the disease.

PATHOLOGY.—When virulent tubercle bacilli become deposited in an organ or tissue of the body suitable for their development, they, by their irritation, set up a mild inflammation and increased growth of cells in the immediate vicinity, while leucocytes emigrate from the surrounding capillaries. The cells are distinctive in character, a few being large multi-neucleated and branched cells called "giant" cells, and the remainder, much more numerous, are epithelioid and lymphoid cells. Tubercle bacilli are frequently seen in the giant cells or their vicinity on microscopic examination. The whole constitutes a rounded mass not larger than a pin's head or millet seed, grey in colour, and non-vascular, called a "tubercle." Many of these tubercles are formed in the vicinity of the bacilliary infection, and by their coalescence into masses there are formed the larger nodules, still called tubercles, though varying greatly in size, which constitute the characteristic lesion of tuberculosis. A distinct feature of these nodular growths is their tendency to undergo a caseous degeneration, commencing at the centre of the nodule but ultimately involving the whole mass, which then consists of a mass of structureless and granular *débris* with fat and mineral salts, usually a dirty yellow in colour, and varying in consistency from that of a slimy, thick cream to a soft, ripe cheese; hence the name given to the process, *caseation*. Sometimes a further degenerative change takes place, viz., *calcification*, in which the deposition of mineral salts results in the nodule taking on cretaceous properties, it being hard and gritty to the touch when cut.

In other cases there becomes developed in the nodule, especially in the neighbourhood of its wall, a quantity of fibrous tissue, giving it a solid and leathery consistency. This fibroid degeneration usually occurs in the

DESCRIPTION OF PLATE.—A. Trachea or windpipe. B. Normal lung tissue. C. Normal liver. D. Gall bladder. E and G. Stage of caseation. F. Nodule forming. H. Stage of calcification.



LUNGS AND LIVER OF COW AFFECTED WITH TUBERCULOSIS.

(*About one-sixth natural size.*)

tubercular growths on serous membranes, the nodules becoming pearly or stony in colour, and giving rise to the condition known as "grapes." On section of these bunches of nodules many of them will be found to be caseous, although the majority are fibrous. Each of these three conditions of degeneration is indicative of a varying chronicity of the lesion, and therefore of its age; while the grey tubercle, undegenerated, is always of recent formation.

The *encapsulation* of tuberculous abscesses often occurs by the formation round them of a thin but strong wall of fibrous tissue, whereby the contents are cut off from the circulation, and may remain passive for a long period. The contents often dry up and become mummified, in which case the walls may collapse and heal together, forming a mass of scar tissue which gradually contracts and may become almost obliterated. This is what happens when the "cure" of a local focus of tuberculosis in the lungs or elsewhere takes place.

The lesions of tuberculosis may exist in any part of the body, but bone, muscle, and nervous tissue are not often the seat of the disease. In a long series of *post mortem* examinations, of which notes were taken by the author, tuberculous lesions were found in the following organs and tissues, set down in the order of frequency:—Lungs (and pleura), liver, lymphatic glands, intestines, mesentery and peritoneum, spleen, udder, uterus, kidneys, ovaries, and pericardium. The different groups of lymphatic glands were found to be most frequently affected in the following order:—Bronchial and mediastinal, mesenteric, post-pharyngeal, sublumbar, hepatic and mammary. In pigs the post-pharyngeal lymphatics are affected more frequently than any other.

LOCAL AND GENERAL TUBERCULOSIS.—As regards the primary lesions of tuberculosis, and the spread of the disease to different parts of the body, consideration may be given under three heads—

1. *Primary Localized Tuberculosis*, in which the lesions are confined to one organ or to one organ and its immediate efferent lymphatic glands.
2. *Secondary Localized Tuberculosis*, in which lesions also exist in an organ or part remote from the seat of the primary focus, but connected with it by lymphatic vessels (efferents from the primary focus) by means of which the infection has been conveyed.
3. *Generalized Tuberculosis*, in which lesions exist in organs and parts remote from each other, and unconnected directly by lymphatic vessels, the infection having been spread from primary or secondary foci by means of the general blood circulation.

Primary Localized Tuberculosis occurs as a result of infection from the exterior of the body into some part other than the blood stream. Familiar instances are (*a*) lung lesions caused by the inhalation of bacilli, and their absorption through the wall of the air cells into the lung tissue; (*b*) intestinal or mesenteric lesions through the ingestion of bacilli with the food and their absorption into the wall of the intestine or the mesenteric lymphatic glands; and (*c*) pharyngeal lesions resulting from the action of bacilli in the food or in mucus from the lungs deposited on the tonsils and absorbed through the tonsilar follicles into the lymphatic vessels of the post-pharyngeal lymphatic glands. This is the most frequent track of infection in pigs.

It does not follow, however, that lesions always occur in the tissues or gland which the invading bacilli first reach. They may, and many times do, pass on by the lymph stream from the tissues in which they are first deposited to lymphatic glands beyond, before becoming arrested and assuming their disease-producing activities. Hence tuberculosis of the bronchial glands is often found as a primary lesion without the lung tissue or other part of the body having been invaded. Carcasses affected with primary localized tuberculosis are not condemned wholly as unfit for human consumption. The organ or tissues in which the disease exists together with the tissues in which their efferent lymphatic vessels ramify are alone likely to be dangerous.

Secondary Localized Tuberculosis. — This occurs when bacilli from existing lesions are conveyed by means of the lymph stream to a remote gland or organ in which they become deposited and set up the disease. At times glands or organs *en route* may be passed through without tubercle being set up. As instances, may be taken secondary infection of the mediastinal glands or of the lungs and pleura from foci in the liver—in which case the bacilli would pass respectively along the lymph vessels of the vena cava into the mediastinal glands and thence into the pleural cavity or lungs.

To determine definitely that the trouble is a secondary localization when lesions are found remotely situated requires a considerable and accurate knowledge of the anatomy and relationship of lymphatic vessels and glands, hence the necessity of such knowledge being possessed by meat inspectors so that the public health may be conserved without unwarranted loss to butchers.

Generalised Tuberculosis.—This has occurred whenever there are two or more seats of disease which are unconnected by lymphatic vessels*; that is, when the bacilli have entered the "general" blood stream and are spread by it. The word general is given the emphasis of inverted commas because the presence of bacilli in some parts of the circulation is not *necessarily* followed by generalization. In the portal circulation they are likely to be arrested in the liver; and again, when emptied out of the thoracic duct into the blood stream at the jugular vein whence they pass through the right heart they may be arrested in the lungs; but generalization is likely to soon follow because of the numerous foci so created in the liver and lungs respectively.

In generalized tuberculosis the carcass is wholly condemned as unfit for human consumption.

Statistics gathered at different times show that in about 14 per cent. of all cattle affected with tuberculosis the disease is generalized.

Meat Inspection and Tuberculosis.—On the subject of the condemnation of the meat or carcasses of tuberculous animals, in addition to what has been already said, it may be well to quote the resolutions of the Inter-State Conference of Government Veterinary Surgeons (Messrs. W. C. Quinnell, M.R.C.V.S., Queensland; Ed. Stanley, F.R.C.V.S., New South Wales; and S. S. Cameron, M.R.C.V.S., Victoria), held at Melbourne in 1902:—

Resolution 1.—"That when tuberculosis exists in only one organ, including the lymphatic glands receiving lymph from that organ, or in only one distinct group of lymphatic glands, or in only one other isolated

* This statement requires to be qualified in the case of two or more separate lesions being the result of distinct primary inoculation.—S.S.C.

situation, the part of the animal only which is so affected should be condemned; except when such local tuberculosis is concomitant with emaciation, in which case the whole carcass should be condemned."

Resolution 2.—"That when tuberculosis exists in two or more places (organs, glands, membranes or tissues) not directly connected by lymphatic vessels, the whole carcass should be condemned."

SYMPTOMS.—Tuberculosis develops slowly and insidiously. For this reason, as also because of the variety of vital organs and tissues which it may attack, the symptoms are, in the earlier stages, at all events, very indefinite and variable. Except in the case of lung invasion, it is not until the disease has commenced to interfere with nutrition that the symptoms are sufficiently pronounced to attract attention.

When occurring in the lungs, there will be an occasional short, dry: weak cough, or "hoose," which is especially provoked and accompanied by blowing or respiratory distress on the cow being driven into the shed for the morning milking or when it is inordinately hustled at other times. There may be a dryness and scurfiness of the coat, with a hide-bound skin, and the appetite may be capricious. If the disease happens to be in that region of the lungs which can be effectively sounded, *percussion* may reveal dullness in patches, corresponding to the diseased areas in the lungs. *Auscultation* is, however, more satisfactory as a means of physical examination of the chest. Creaking and wheezing sounds are heard over circumscribed and isolated areas; and when there is a grapy condition of the pleura the abnormal pleuritic sounds confuse or completely cover up normal lung sounds. It is a good plan to cover over the mouth and nose with a bag when sounding the chest, so as to induce heavy, deep breathing, by which the sounds are rendered clearer.

In tuberculosis of the intestines and liver, the former of which frequently attacks young, immature cattle, there may be fœtid diarrhœa, intermittent in character, but very persistent.

When there is extensive invasion of the lymphatic glands, some of those superficially situated are likely to be involved, and their enlargement may be felt under the skin, in the front region of the chest, the flank, and the angle of the jaw and neck (post-pharyngeal lymphatic glands). In the latter case the enlargement is often accompanied by a more or less pronounced snore in the breathing. Tuberculosis of the glands in this region may usually be distinguished from actinomycosis (lumpy jaw) by the fact that the swelling is moveable, and fluctuates on pressure, the actinomycotic tumour being usually hard and firmly fixed to the jaw-bone.

The disease progresses slowly in most cases, and it may be many months, or even years, from the time of infection before serious inroads on the general health are manifested. As the disease advances, the cough will become more frequent and distressing, the cow ceases to thrive well even on good food, the coat loses its gloss, the hair is dry, harsh, and staring, the skin becomes tight, the eyes may be sunken, but at times they stand out abnormally and are glassy looking, there is often a discharge of tears, the cow stands with the back arched and belly tucked up, although in some cases there is a tympanitic enlargement (hoven) of the abdomen after feeding, and altogether the cow presents a dejected and sorrowful appearance. The appetite becomes capricious, and there may be attacks of diarrhœa at intervals. The milking function is not usually diminished, but the milk is thin and watery, and deficient in butter fat. The temperature, if taken daily, will be found to be erratic; sometimes it is raised

a degree or more, and sometimes it is sub-normal. Then comes the stage of emaciation, when the animal wastes rapidly, almost visibly, until it is miserably thin and weak. The skin and mucous membranes become blanched; the cough is more markedly painful and paroxysmal, and is easily induced by pressure or a slight blow on the ribs; the temperature is now always high, ranging from 103 degrees to 105 degrees F., and the animal gradually sinks into a condition of marasmus, so helpless and complete that death quickly ends the scene.

DIAGNOSIS OF TUBERCULOSIS.—Considering that most of the symptoms detailed are such as may occur in any slow wasting disease, and that none of them are peculiar to tuberculosis, it follows that accurate diagnosis of the disease from objective symptoms alone is a somewhat difficult matter, and, in point of fact, is seldom accomplished in the early stages, except there is a history of tuberculosis in the herd. Consequently, such adventitious aids to diagnosis as microscopic examination, artificial culture, Arloing's agglutination test, experimental inoculation, and the tuberculin test, are practised. The value of all but the last of these is largely discounted by the length of time they involve, and other drawbacks, and in practical working the tuberculin test is the best aid to rely on, either for confirming a diagnosis or for detecting the presence of tuberculosis where no symptoms are discernible.

THE TUBERCULIN TEST.—Tuberculin is a sterilized glycerine extract of the culture of the *bacillus tuberculosis*. It contains the products of the growth of the bacilli, and, when injected into a tuberculous animal, there results a passing fever, with a corresponding rise of temperature. This does not occur when the tuberculin is injected into a non-tuberculous animal, but it is practically constant in tuberculous animals, perhaps the only exception being in the case of animals very extensively affected with the disease, in which case the system seems to be so highly charged with tuberculin already that there is no response to the small additional amount constituting the usual dose for injection. Conversely, in animals only slightly affected the rise of temperature is often very high. These peculiarities of the effect of tuberculin—*i.e.*, the fact that the rise of temperature is frequently in inverse ratio to the extensiveness of the disease—may be taken in some measure as a guide in estimating whether the disease is generalized or not. Tuberculin properly applied, and its action properly interpreted, may be relied on almost absolutely to manifest the existence of tuberculosis; but, except in so far as a guide is furnished by the peculiarities mentioned, it gives no idea as to the stage of disease the animal is in.

Technique of the Test.—An impression prevails that the application of the tuberculin test is a simple matter. While the routine procedure may appear simple, there is a great liability to error at almost every stage of the process, except the most scrupulous and methodical care is exercised. The truth of this is so strongly enforced by extended experience that there need be no hesitation in declaring that the application of the test ought not to be intrusted to other than qualified veterinary surgeons, who have had special training and practice at the work. In other hands failure is bound to result, either in the condemning of healthy cows or the passing of diseased ones, and it is to the fact that operators have not always been sufficiently experienced or careful that the test has at times been discredited.

Before commencing the test the operator must be satisfied that the cows to be treated are—

(*a*) Not suffering from any acute disease or febrile symptoms, wounds, tumours, or local inflammation, such as mammitis;

(*b*) Not within three days of the "bulling" period, either before or after;

(*c*) Not within three weeks of calving;

(*d*) Over one week calved, and that they have cleansed properly—else a rise of temperature cannot be relied on, inasmuch as it may occur in association with one or other of the conditions mentioned, independent of tuberculin injection. The operator must be provided with a book in which are blank temperature charts, one for the use of each cow. On the chart should be entered the name, colour, brands, and age of the cow, whether in calf or not, and, if so, how long gone, and any other particulars that may be noted at the first examination of the cow which are likely to have a bearing on the test. Attached is a specimen copy of the chart regularly used by the author:—

No. 1.—"Creamy," 5yrs., Brown and White, V Right Rump, in Calf 3 Months.

Dose.	Before Injection.			After Injection.						Rise.	
8 p.m.	5 p.m.	8 p.m.	Mean.	6 a.m.	8 a.m.	11 a.m.	12 p.m.	2 p.m.	Mean.	Highest.	Mean.
105	...	...	...	...	...	·7	·7	...	...	3·9	
104	...	...	...	...	·8	...	...	·8	·9	...	3·1
103	...	...	...	·8							
102	..	·1									
101	·5	...	·8								
100											

The temperature of each cow must be taken at least twice, at intervals of not less than two hours, before the injection of tuberculin. If neither record is obviously abnormal, the mean of the two may be taken as the standard temperature from which to calculate a reaction rise. The most suitable time for the first temperature is prior to the evening milking, when the cows are bailed up as ordinarily in their customary stalls. They will then be more likely to show an ordinary temperature than if taken up at an unusual time. The temperatures must be taken in definite order, and the same order must be maintained for the injection and the subsequent temperatures. The thermometers used should be numbered, marked, and tested against each other on one cow prior to use, any variation being allowed for on the chart. As far as possible, the same thermometer should be used for the same cows throughout the test.

It is well to use one make of tuberculin continuously, as the different makes are standardized differently, and the calculation of altered dosage and effect is confusing. Of Koch's tuberculin about five drops is the dose for a medium-sized cow in fair condition, and this dose may be varied according to age, size, and condition. For old, emaciated cows, suspected to be tuberculous, double doses may be used. The dose requires to be diluted with five times its bulk of a .5 per cent. solution of carbolic acid in distilled water, bringing the amount to be injected up to an average of thirty drops, or half a dram. In testing a herd, it is more expeditious and convenient to make the dilution for a number of cows at one time.

Pour the contents of the Koch's phial into a small graduated measure-glass, and measure it. Then pour it into a larger graduated measure-glass, and add five times the quantity of diluting fluid. The syringe may be filled from this by drawing up the required dose. All air should be excluded from the syringe by holding it needle upwards, and pressing the piston until bubbles cease. An ordinary veterinary hypodermic syringe is used, with short stout needles, of which half-a-dozen or more extra ones need to be always provided in case of breakage. Socketed needles take less time to adjust than those with a screwed joint, and are much to be preferred. The injection is made in the loose skin immediately behind the elbow on the right side, a fold of the skin being gripped with the two fore-fingers and thumb of the left hand, so as to form a vertical fold lengthways, into which the needle of the syringe is plunged with the right hand, care being taken that the point of the needle does not protrude through the skin. On the piston being forced in, the needle is removed, the fold of skin loosened, and the little pocket of fluid gently massaged until it commences to disperse. As far as possible aseptic precautions should be observed throughout the test. At any rate, prior to injection the hair and skin at the seat of injection must be washed with a solution of corrosive sublimate, and between each injection the needle and syringe need to be rendered sterile. This is best done by first flushing in a half per cent. solution of carbolic, then in absolute alcohol, and finally in carbolic solution again.

After injection, the cows must be treated as ordinarily in every way, being fed, watered, and the like, as usual, and brought up to milk at the usual time next morning. This will be about the time—ten hours after injection—when it is usual to commence taking the reaction temperatures. This is done by taking the temperature in the same order and under the same conditions as before, at least three times, at intervals of two hours. The non-reacting cows will usually have a lower temperature in the morning. If by the fourteenth hour (third temperature) no tendency to increase of temperature is observable, the animal may be regarded as free from tuberculosis. In tuberculous animals there is usually a slight rise by the tenth hour, which increases up till the sixteenth or eighteenth hour, and then gradually declines, and has passed away by the twenty-fourth hour. A typical reaction temperature chart shows a gradual rise to a maximum, and a corresponding gradual fall, producing what is known as a "reaction curve" (see specimen chart). During the taking of the reaction temperatures each cow must be keenly observed, to catch any unusual symptoms or attitude, such as bellowing, excitability, inappetence, diminution of milk, intermittent and jerky urination, diarrhœa, staring coat, nasal and lachrymal discharge. All or any of these must be carefully noted, and given due weight when interpreting a reaction. A rise of two or more degrees Fahr. over the mean temperature prior to injection is held to constitute a reaction, provided that—(*a*) the prior mean temperature has not been composed of widely dissimilar records, (*b*) that there is an absence of any other recognisable cause, and (*c*) the rise has been consistently maintained throughout the usual period. Given these conditions, all is plain sailing, and a diagnosis of tuberculosis may be confidently ventured. It is in the cases where there is variation from these conditions, such as a continuous or single high temperature before injection, an unevenness of the reaction curve, and the like, that the discrimination and judgment of the examiner is taxed in interpreting the temperature records.

TABULATED REPORT CONCERNING TUBERCULIN TEST.

Cow.	Description.	Age.	Temperature before Injection.			Temperature after Injection.				Rise.		Abnormal *post-mortem* Appearances.	
			6 hrs.	½ hr.	Mean.	12 hrs.	16 hrs.	20 hrs.	Mean.	Highest.	Mean.	Tubercular.	Other.
No. 1 ..	Prime milking condition; sleek and fat	7 years	101·5	101·2	101·3	104·5	104·2	104·5	104·4	3·2	3·1	Large coalescing tubercular abscesses throughout liver substance	Hydatid cysts in lungs and liver; flukes in liver
No. 2 ..	Prime milking condition; sleek and fat	aged ..	102·5	102·0	102·3	105·7	105·8	105·8	105·8	3·5	3·5	Extensive tuberculosis of intestines and mesentery; a few tubercular nodules in both lungs	A few hydatid cysts in liver
No. 3 ..	Fair milking condition; slightly hide-bound, with staring coat	6 years	103·6	101·6	102·6	105·2	102·6	103·1	103·6	2·6	1·0	Caseous tubercular nodules throughout liver and intestines	Flukes in liver; left lung hepatized in patches
No. 4 ..	Fair condition; hide-bound coat	aged ..	101·6	101·0	101·3	104·8	105·7	105·7	105·4	4·4	4·1	Tubercular abscesses and nodules in both lungs; walls of large intestines (cæcum and colon) studded with miliary tubercles; caseous tubercles in liver	Slight pleuritic adhesion of left lung
No. 5 ..	Prime milking condition; sleek and fat	aged ..	101·4	101·4	101·4	102·0	104·5	104·2	103·6	3·1	2·2	Small tubercular abscesses and nodules in both lungs, some grey, others caseous	Nil

Occasionally what is known as a local reaction to tuberculin may be observed—that is, in the case of tuberculosis of external lymphatic glands or of the udder, an inflammatory condition, local to the diseased part, is induced during the period of tuberculin influence. Hence the necessity to examine the udders and external glands of all cows showing signs of reacting, and also of making a thorough physical examination of the chest.

It should be mentioned that, by an extensive set of tests carried out by the author in conjunction with Mr. H. W. Potts, F.C.S., &c., Principal of the Hawkesbury Agricultural College, New South Wales, at the Leongatha Labour Colony, it was clearly demonstrated that tuberculin injection interfered in no way with the milking function in healthy cattle; neither in quantity of milk nor in butter-fat value could any variation be detected.

The preceding table, giving general description, temperature, and *post-mortem* appearances of the reacting animals in a herd is published as a type for reference and guidance.

UDDER TUBERCULOSIS.

Mammary Tuberculosis, or tuberculosis of the udder is almost always secondary to lesions in other parts, and it seldom occurs except when the disease is generalized. The author has, however, come across at least four cases in which the most careful examination failed to reveal the slightest trace of the disease in any other part of the body; and other cases also in which, by the localization of the lesions in other organs, and their apparent incipiency as evidenced by the slightness of the degenerative process, the presumption was forced that the udder lesions had been primary. In three of the four cases referred to the mammary lymphatic glands only were diseased, but in the fourth there were numerous caseous and coalesced tubercles throughout the gland tissue of the quarter; the mucous lining of some of the milk ducts had on it yellow caseating granulations, and the interstitial fibrous tissue in parts was indurated. One of the three cases in which the mammary lymphatic glands alone were affected was a heifer calf, twelve weeks old, that had been used for the cultivation of calf lymph for vaccination. As might be expected at this age, the undeveloped gland was practically devoid of mammary tissue, and consisted merely of a mass of fat. Each of the supra-mammary lymphatic glands was enlarged, and had undergone caseous degeneration.* The cue as to the method of infection was given by the condition of the umbilicus or navel, which had not properly healed, and which was at the time of slaughter still somewhat ulcerated. In view of the fact that the afferent vessels of the mammary lymphatic glands drain lymph from the flank walls of the abdomen and umbilical region, the deduction that the disease was conveyed from tubercle-infected litter or bedding through the unhealed umbilicus, and thence by the lymphatic vessels to the mammary lymphatic glands, appears feasible. In the *Revue Générale de Médecine Veterinaire* for March, 1903, there is a case of primary tuberculosis of a milking cow recorded by Conté, who puts forward the view that fragments of straw contaminated with tubercle bacilli may have entered the teat duct, and thus caused infection of the gland. In support of this view, he states that the owner had for some time been using as litter straw taken from palliasses removed from certain hospitals, and concludes that "the straw had probably been soiled by discharges from tuberculous patients." Such a method of infection could not have been possible in the case of the calf now being

* The specimen is preserved in the museum of the Board of Public Health, Melbourne.—S.S.C.

recorded, for the undeveloped gland was devoid of mammary tissue, and the teats at such an early period are practically impervious. A more likely explanation of the primary cases than that offered by Conté would be infection through wounds in the skin of the udder from tubercle-contaminated litter, or in the case of a consumptive milker moistening his hands with his sputum for the milking of a cow with chapped teats.

Udder tuberculosis is most often confined to one or both hind quarters of the udder, the fore ones being less frequently attacked. The differentiation between this condition and an ordinary inflammation or "blind" quarter is important, but not always easy to decide on. In the first place, it is seldom that young cattle have tuberculous udders, so that an udder complaint in cows before the sixth calf may usually be dismissed as non-tubercular. In tuberculosis, there is usually no diminution of milk secretion—in fact, it may be slightly increased, but is thin and watery, and the quarter tends to gradually enlarge, the swelling being firm and painless; whereas in ordinary inflammation the milk becomes curdled or ceases to be formed, and the quarter shrivels after the subsidence of the acute inflammation. On very careful manipulation, and comparison with the other quarters, a nodulated or knotted condition of the substance of the quarter may be felt. Sometimes a soft patch, indicative of a caseous or purulent abscess, may also be detected, especially if it is near the surface. To confirm suspicion, microscopic and bacteriological examination of the milk for bacilli is necessary. Other plans include the extraction of a little piece of tissue from the quarter by means of a "harpooning" instrument, or the drawing out of a little matter from a suspected abscess with an aspirating syringe—the material in both cases to be examined microscopically and bacteriologically.

The proportion of tuberculous cattle that are affected in the udder is from 2 to 3 per cent. In a series of *post-mortem* examinations of tuberculous cattle made by the author, over 5 per cent. had udder tuberculosis, but this is unusual. The milk from a tuberculous udder contains tubercle bacilli in most cases, and is infective to mammals partaking of it, particularly the young. Piglings are particularly prone to contract tubercle in this way, and many authentic cases are on record of tuberculosis in children being caused by drinking such milk.

On the question as to whether the milk of tuberculous cows with healthy udders is infective or not, the majority of investigators have concluded that it is not. On the other hand, the investigations of a not unimportant minority, led by Bollinger, who was successful in 55 per cent. of cases in producing tuberculosis in animals by ingestion and inoculation of the milk of tuberculous cows having healthy udders, affirm that such milk may contain bacilli and be infective. The author has elsewhere* reported on an investigation by him of this phase of the subject, which in a large measure would seem to support the conclusions of the minority.

* Report to the Board of Public Health on, 1901.

THE FUNCTION OF SILICA IN THE NUTRITION OF CEREALS.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist.

The fact that cereals and other grasses contain large quantities of silica is well known, but, although it may amount to 50, or even 80, per

cent. of the ash left after burning, we know little or nothing as to its function in the economy of the plant. It was at one time suggested that it conferred increased strength and rigidity upon the stems of cereals, and that the laying of crops was due to the absence or deficiency of silica in their haulms. This suggestion is, however, incorrect, and, as a matter of fact, laid crops may contain more silica than normal ones. The presence of silica does not seem to protect grain against the ravages of various parasites and destructive fungi, but does, on the other hand, appear to economize the consumption of mineral food by the plants. Evidence of its importance is afforded by the fact that when oats were grown in artificial nutrient solutions deprived of silica, the formation of grain was delayed, and the grain was deficient in quality and quantity. A recent publication (by A. D. Hall and C. D. Morrison), from the Rothamstead experimental station, is of great interest in this connexion. The authors find (Proc. of Royal Society, 1896) that silica does take part in the nutrition of cereals, especially of such as barley, whose ash is especially rich in silica, and that a free supply of soluble silica induces an increased and earlier formation of grain. The soluble silica seems to act by increasing the assimilation of phosphoric acid by the plant, not by an indirect action on the soil, but by a direct one upon the plant. Whatever the nature of the action may be, its importance in the cultivation of cereals is sufficiently obvious, for the presence of soluble silica in the soil will enable a smaller dressing of phosphoric acid to produce the same result as a larger one, or will enable the same dressing to bring about earlier and more perfect ripening and fruiting. All ordinary soils consist very largely of silica or of compounds of silica with insoluble bases. This silica can only be absorbed when brought into solution, as takes place to a very limited extent by the aid of the carbon dioxide dissolved in the water of the soil, and in other ways. The presence of alkaline carbonates in the soil increases the amount of soluble silica available for absorption by the plant, and hence must benefit it so long as the amount of alkali is not so great as to injuriously affect the roots of the plant. One objection put forward to the use of artesian water for irrigation is that the sodium carbonate which such waters may contain, to the extent of 30 or 40 grains per gallon, by accumulating in the soil, may render them injuriously alkaline. Analyses by Mr. Guthrie (*Agricultural Gazette of New South Wales*, July, 1906, p. 686) seem to show no such rise of alkalinity as might be expected after the irrigation by alkaline artesian water. It is possible that the sodium carbonate, acting on such substances as aluminium silicate in the soil, may form sodium silicate, which is capable of absorption by the plant, and is at once seized by it, leaving aluminium hydrate in the soil. This would, however, necessitate an increase in the percentage of sodium in the plant, of which we have no evidence. In any case, however, it is worthy of experimental trial as to whether the use of feebly alkaline artesian water for irrigation, instead of being iniurious to cereals grown for grain may not favour their growth and production of grain, by rendering more of the silica of the soil available for their use. This soluble silica, as Hall and Morrison have shown, acts in the same way as an addition of phosphoric acid in favouring the formation and early ripening of the grain.

LIME AND ITS FUNCTIONS IN AGRICULTURE.

F. E. Lee, Agricultural Superintendent.

There are few substances which are used by the farmer that are less understood than lime. The name does not convey the information—that on this substance depends, to a large extent, the health and vigour of both stock and vegetable life. Perhaps it is, that lime in some of its forms is such a familiar object, that constant association has produced that contempt that is said to be bred by familiarity. No matter what the cause may be, the fact remains that the value of lime, as a soil amendment, solvent of plant food, and corrector of acidity, is not properly appreciated by the great majority of farmers in the State. Lime is sometimes spoken of as a manure, but this is an error; while lime forms one of the most important constituents of the soil, and is an essential ingredient in the ash of all plants, it is not a manure, but rather comes under the heading of a soil amendment.

Different Forms of Lime.

Confusion may often arise in the mind of a farmer as to what lime really is, and this confusion may be made worse when the difference in action of the various forms of lime is not completely understood. Lime is found in natural deposits in many parts of Victoria, in the form of limestone, or carbonate of lime. In this State, the lime is practically insoluble by rain water, and is of little or no value either as a soil amendment or plant food. If the limestone occurs, as it often does, as an outcrop, the surface gradually crumbles down by the action of the weather.

Limestone, when subjected to the influence of heat, loses the water and carbonic acid gas with which it is combined, and the product is then known as oxide of lime, burnt lime, caustic lime, or unslaked lime. As it comes from the kiln, the lime is still in the stone form. If allowed to remain exposed to the air, or if water is added, burnt lime crumbles into a fine powder, and is then known as slaked or hydrated lime; it is in this form that lime is most familiar, and in this form it is generally made use of by the farmer. After slaking, lime reverts, or turns back, to the carbonate form, but as it is then in a state of fine division, it is of much more service to plant life. Lime is also found associated with other substances, such, for example, as in gypsum or sulphate of lime, deposits of which are to be found in many localities in the northern districts of Victoria. Lime is also to be found in the ashes of all plants in greater or less abundance according to the class to which the plant belongs. The ash of the wood of fruit trees and vines is particularly rich in lime, as are also the ashes of most of our Australian hardwoods.

Functions of Lime.

The functions of lime are many and varied. On heavy clay soils, lime has the power of "flocculating," or binding the clay particles together in larger groups, thus permitting the soil to be easier worked, and allowing the better passage of moisture, air, and warmth. On light sandy soils, the particles of which are already too loose and separate, lime has the faculty of binding the particles together, which helps to arrest the rapid drainage of such soils, and at the same time prevents their becoming too hot. The action of lime then is exactly opposite on two types of soil.

It is, however, as a corrector of soil acidity that lime is most favorably known. Any soil which is badly drained, or which contains an excess of vegetable matter, gradually becomes acid, due to the action of soil bacteria in the latter case. When the degree of acidity passes a certain point, the vegetation changes character, and we find the good grasses supplanted by a growth of coarse vegetation.

Swamps are conspicuous always for the growth of rushes, reeds, and coarse tussock grasses they produce. The action of lime on drained land is to neutralize the natural acidity, and "sweeten" the land. An easy method for the farmer to ascertain if his land contains too great a degree of acidity, is to place a piece of ordinary blue litmus paper on a sample of moist soil; if the paper rapidly turns a vivid pink, it may safely be assumed that the land requires a dressing of lime. If the change of colour is effected slowly, it is an indication that, while lime is needed, a light dressing will suffice. Blue litmus paper may be procured from any chemist, in small books, costing 3d. or 4d. for 50 sheets.

As a solvent of latent plant foods, lime is of the greatest assistance to the farmer. It must be remembered that time exercises a chemical action in the soil, and it will be found, especially in clay soils, that a dressing of lime or gypsum plays an important part in releasing potash from its insoluble forms. There used to be an old saying among English farmers that lime "made a rich father and a poor son," and this old adage, while not strictly true, has nevertheless a foundation of truth. The manner in which lime is nowadays used differs entirely from the methods in vogue 50 years ago; then it was the custom to apply a dressing of from 5 to 10 tons per acre, the effects of which would remain for eight or ten years. It is the custom now to use 5 to 10 cwt. per acre, and make the application every three or four years, the effect being more noticeable and more lasting. One more example of the benefit of lime in the soil is sufficient to completely convince the progressive farmer of the necessity of giving more attention to this valuable aid to agriculture. Almost without exception the artificial manures that are used require to find in the soil a base with which to combine, or otherwise they would leach out of the soil after periods of heavy rain.

The universally used superphosphate, above all other manures, should be held near the surface of the soil, or, in other words, within the sphere in which the roots of all crops draw their nourishment from. As has been pointed out in a previous article on artificial manures in the *Journal*, the phosphoric acid in superphosphates is rendered "water soluble" for distributive purposes mainly, and it is well-known that within a comparatively short period after application—this water soluble phosphoric acid reverts or changes back to the more lasting, but slightly less soluble form of "citrate soluble"; this reversion is brought about by combination with lime found in the soil. The nitrogen in sulphate of ammonia, bonedust, blood manure, and farm-yard manures, is released by the action of soil organisms, and after combination with lime, is slowly taken advantage of by the roots of crops. It would be a difficult matter to find a soil absolutely deficient in lime, but there are many thousands of acres in Victoria, the lime content of which is below what it should be. Land which has been continuously grazed by dairy cows is liable to become exhausted in lime, owing to the large amounts removed in milk. The constantly recurring outbreaks of cripples and kindred diseases are, in themselves, sufficient to indicate that many localities are already suffering

from an impoverishment of lime or phosphatic materials in the soil, and unless some improvement is made in the direction of treating pastures, these troubles are likely to increase.

How and when to Apply Lime.

Before the maximum benefit can be derived from the use of lime, the object with which it is given must be clearly understood. If it is desired to break down stiff clay soil, caustic or burnt lime should be used, so that the double object of correcting acidity and improving the physical condition of the soil may be achieved. If it is desirable to arrest the rapid drainage of sandy soils, slaked or mild lime is best. For peaty soils, caustic lime is preferable, because it promotes decomposition more rapidly; for newly-drained land, caustic lime is best on account of the usually high degree of acidity in such soils, and also in order to assist in the free passage of air and warmth. Under no circumstances should lime ever be applied within at least five or six weeks of the sowing of seed or artificial manures. The proper time to apply lime is in the early autumn, and it should be distributed broadcast, or by mechanical spreaders. Lime should never be ploughed in, but is best applied immediately after ploughing, and then harrowed in. The logic of this will be readily grasped when the reader considers that it is the upper portion of the soil in which plant roots mostly feed, and every effort should be made to improve that portion of the soil. If the lime were to be ploughed in, the effects of it would only commence 6 inches below the surface, and the objects desired would be defeated.

Gypsum.

Under the name of gypsum or sulphate of lime, there are to be found in various parts of Victoria deposits of lime compounds. As is well known, superphosphates contain large amounts of gypsum produced during the process of manufacture, and an impression widely prevailed that superphosphates were nothing more or less than gypsum, to which phosphoric acid had been added. The more general use of manures, and the information disseminated by the Department of Agriculture has completely dispelled this illusion.

Gypsum has deservedly of late years come into vogue in many of the southern districts of Victoria as a top dressing for grass land. The particular function of gypsum seems to be the unlocking of the potash compounds held in an insoluble condition by clay soils. It has furthermore been remarked that this substance promotes a growth of clover in pastures where the grass has not hitherto been a prominent feature. The experimental pasture fields distributed from the eastern to western extremes of Southern Victoria have done much to popularize the use of gypsum, and although the growth of grass has not been conspicuously promoted, the droppings of the stock feeding on the lime and gypsum plots is sufficient evidence to show that the feeding qualities of the pasture have been improved by their use. As an absorbent of ammonia, gypsum takes a leading place, and its use in the stables is to be strongly advocated in the prevention of the loss of the most valuable portion of animal excrement, viz., the nitrogen. Sprinkled about the stable and stall, gypsum not only absorbs the escaping ammonia, but greatly minimizes the objectionable smell of these places. Where stable refuse is conserved outside, a few handsful of gypsum could, with advantage, be used with every barrow-load of refuse.

CONCLUSION.

As the purpose of this article is simply to direct attention to the use of lime, it is to be hoped that sufficient has been said to impress the reader with the fact that where lime can be cheaply procured, its use is to be recommended for most crops. Gypsum and marl serve much the same purpose as lime, but it must be borne in mind that they have no caustic effects, and that larger amounts are necessary to effect the same purpose. By the fruit-grower lime should be used to a much greater extent than it is, on account of the vigorous stocky growth it promotes, and for the assistance it renders in hastening maturity.

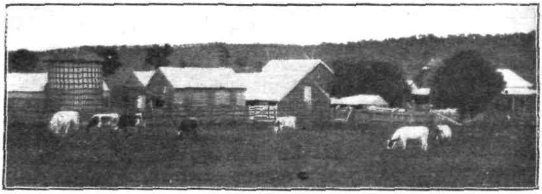
While every soil does not need lime, there are few portions of Southern Victoria where moderate dressings could not be used with advantage.

CLOSER SETTLEMENT STUDIES.

J. M. B. Connor, Dairy Supervisor.

A.—AN UP-TO-DATE DAIRY FARM.

The milk supply of our large cities is to-day one of the most important problems of public health. Milk constitutes such an important factor of



GENERAL VIEW OF FARM BUILDINGS.

Some of the dairy cows in lucerne paddock.

the food supply, and because of its cheapness and high food values, has such a general use that too much importance cannot possibly be placed on the methods of its production.

To watch the methods adopted of milking cows on many dairy farms is to watch a process of unscientific inoculation of a pure medium with unknown quantities of germ life. From cow to cow the milker goes, taking with him or her, as the case may be, from the last cow milked the particles of dirt caught from the floor, the hairs, the dust, and the germs that adhere to them.

Throughout the whole process of milking, the milk, whilst standing in the bucket, receives its repeated sowings of germinal dirt. In an hour

or two its population of triumphant lives is a thing to make one's blood run cold. And this occurs in what are considered good dairies. Imagine what it must be like where cows' flanks are never groomed, where hands are only washed by accident, where expectorations (tobacco or other) are not infrequent, where, in a word, the various dirts of the dirty milker are at every hand reinforced by the inevitable dirts of the domesticated cow. I could name many dairy farms where these conditions are, in a greater or less degree, normal. All men milking cows, to insure a clean and pure supply, should be required to conform to certain rules and regulations before a permit is issued for the sale of milk for human consumption.

After driving about 6 miles south of the city of Bendigo, along a bush track, through thinly-timbered but poor, uninteresting, and hungry-looking country in its unimproved state, from an agricultural point of view, it

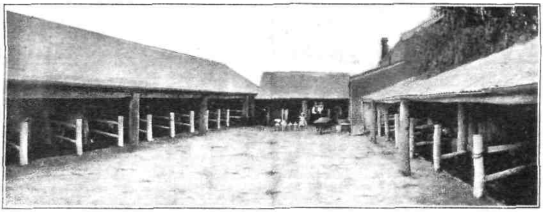
THE HOMESTEAD.

is a great treat to meet with a practical, go-ahead, and up-to-date dairy farmer in the person of Mr. George Lowe, of "Kedleston Dairy," Mandurang, the owner of the farm under review. The farm, which consists of 260 acres of land, is securely fenced and subdivided into convenient paddocks, ranging from 10 to 80 acres, each paddock being provided with a substantial gate painted white. The Sheepwash Creek runs through the property, and it is on the flat near the creek that Mr. Lowe cultivates about 40 acres for hay. Portions of the flat have been under constant cultivation for forty-five years, returning, on an average 2½ to 3 tons of hay to the acre. These good returns are largely accounted for by the practical and sensible method of conserving the whole of the farm-yard and liquid manure, and turning it to account. The balance of the farm, with the exception of 2 acres of orchard adjoining the homestead, and 3 acres of lucerne, is devoted to grazing the dairy herd. Last year the 3-acre paddock was sown with a crop of oats, drilled in at the rate of one bushel to the acre; the lucerne was sown broadcast at the rate of 10 lbs. to the acre. The oats were cut for silage, and the lucerne was at once irrigated, and grew splendidly, giving three cuttings during the

first year. The owner, with the aid of irrigation, intends going in strongly for rye grass, clover, and lucerne growing.

The dairy herd consists of thirty-seven head of good dairy sorts, the Ayrshire strain predominating. They return on an average $2\frac{1}{2}$ to 3 gallons per day, and the milk is retailed in Bendigo with two delivery carts daily, being sold by the quart. Mr. Lowe has built up the herd by constantly culling the duffers, and never losing sight of the fact that it is necessary to have a pure sire, descended from a milking strain, to breed from. The first bull introduced into the herd some years ago was an Oakbank Melbourne Show bull; last year a young milking shorthorn bull was purchased, and will be used from this out. I have no doubt that the cross will be a beneficial one.

The cows are stall-fed over night, thoroughly groomed every day, and bedded down with plenty of straw. Mr. Lowe finds this system gives handsome returns, inasmuch that it provides one of the most valuable products of the farm, abundance of farm-yard manure, for cultivation purposes, besides the benefit of not having to go out into the paddocks on a cold, frosty, or wet morning to yard the cows.



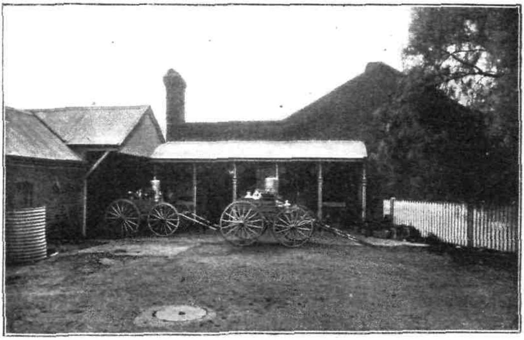
THE MILKING-SHED.

The milkers' hands and the cows' teats are washed before milking, and the milk, immediately after it is drawn, is taken from the byre to the cooling room. It is then strained and run over the cooler; the water, which cools the milk down to 62 deg. F. during the hottest weather, is pumped from an underground tank by a force pump, the water returning to the tank after running through the cooler. There are two large underground tanks, which insures an unlimited supply of water, besides admitting of the occasional cleansing of one of the tanks.

The cow byre is built with lofty walls, is well lighted and ventilated, and opens on to a splendidly paved and beautifully drained court-yard. The roof is double lined, first with palings, and then with corrugated iron. All roofs on the farm buildings are provided with spouting. There are twenty-eight bails, 5 feet wide, paved with nice flat blue sandstone, with a gutter 1 ft. 6 in. at the rear of the cows. A drain, which is 1 ft. 2 in. wide x 4 in. deep, conveys all drainage from the cows and farm-yard buildings generally into a 6-feet brick underground tank, puddled with clay, and afterwards cemented. On this tank there is erected a fairly high pump, and when full, which takes about six weeks, the contents are pumped into a tank on wheels, made for the purpose, and

distributed on the land, or on a large heap of soil, which is turned and well mixed at various intervals, and makes splendid manure. This simple and effective method of conserving this valuable product at a minimum cost is worthy of the attention of every dairy farmer in the State. It is only necessary to see the results Mr. Lowe obtains from his land to know the value of saving all farm-yard and liquid manure. The contrast between this farm and the poor, hungry surrounding country is indeed great. The stable, with loft, is built of brick and stone, pitched with bluestone floor, and contains five stalls. The loft is used for storing oats, bran, and other fodder for the dairy herd and working horses.

Irrigation.—Mr. Lowe knows the value of having an unlimited supply of fresh water conserved for growing green fodder for his dairy herd during the hot, dry months of summer. He has constructed a large dam, with a holding capacity of about a million and a half gallons of water,



MILK READY FOR DELIVERY.

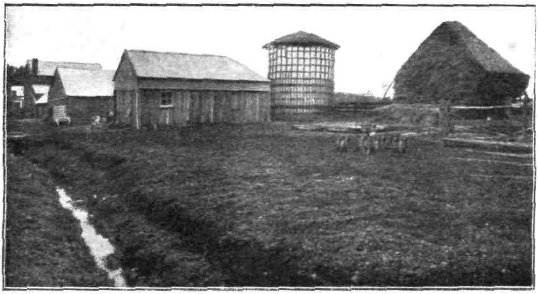
built 20 feet above the level of the homestead. A 2-inch main pipe from the dam is laid on to different parts of the buildings, and is found a great convenience for flushing down the bails and drains. For irrigation purposes, the water is drawn over the bank by a 4-inch syphon, which gives an ample supply for irrigating the lucerne and maize crops during the summer months. If the dam becomes low, it is refilled from the Coliban channel at a cost of £4 per million gallons. This is considered a rather heavy charge, and Mr. Lowe maintains that if the water could be obtained at a cheaper rate it would be used more freely by himself and other farmers for irrigation purposes.

Feeding Methods.

The Silo.—The method of conserving and converting into silage the green succulent feed, which is so plentiful everywhere, as a rule throughout the spring, must in the near future be adopted by every dairyman. Mr. Lowe is so pleased with his short experience that he intends erecting

another overhead silo. The one now in use on the farm has a 70-ton capacity, being 18 feet high, 16 ft. 10 in. in diameter, with 4 x 2 uprights, and 3 x ½ battens, and lined with 22-gauge galvanized iron, riveted. Mr. Lowe found that after the first filling the iron started to bulge out between the uprights, so he put an extra 3 x 2 upright between each of the others to the height of 12 feet, and to further strengthen it he placed two 2-inch iron bands, 2½ in. x ⅛ in., around the silo at a distance of 3 and 9 feet respectively from the ground. The band is in two sections, joined by a bolt, with a screw on each end, so that it can be screwed up in two places. The roof is constructed of thatch, tied down to ordinary saplings secured from the bush close by, and it throws the water off splendidly.

Growing the Crop for the Silo.—The six acres of cultivation land is manured with sixteen loads of farm-yard manure to the acre, and is well ploughed and worked to a fine tilth. It was sown in May with



SILO, CHAFF-HOUSE, AND ENGINE-ROOM.

oats at the rate of 1½ bushels to the acre, and the crop was taken off about the end of November; the 6 acres were immediately reploughed and sown broadcast with maize, and irrigated from the dam three times during the season. Last year, Mr. Lowe informs me that it grew to a height of 10 feet in some places; but, taking the crop as a whole, it averaged 7 feet, being so heavy that the maize binder would not cut it.

Filling the Silo.—The chaff-house is quite close to the silo, and has a door in the roof for the elevator, which is worked with a chain belt running on two sprockets, with cups about 1 foot apart. The green fodder is carted up to a big door in the top of the wall, and thrown in almost on the chaffcutter, doing away with the double handling. The chaffcutter, which keeps the carters going, is driven by a 3½ horse-power oil engine, and cuts about ⅜ inch long, working the elevator at the same time. The silo is filled twice a year, once with the oats, and then with maize.

Feeding.—The fodder, which is taken from the silo by means of a chute, is used at the rate of eight bags a day. It is mixed with three bushels

of bran, and feeds 28 cows daily during the summer months. During the winter the fodder is used at the rate of six bags of maize silage, four bags oaten chaff, and six bushels of bran. The silage was found to be so succulent that it contained enough moisture to sufficiently damp this ration of feed without any addition of water. Mr. Lowe speaks very highly of the great benefits to be derived from always having abundance of silage for both summer and winter feeding, and the condition of his herd speaks volumes for the soundness of his methods.

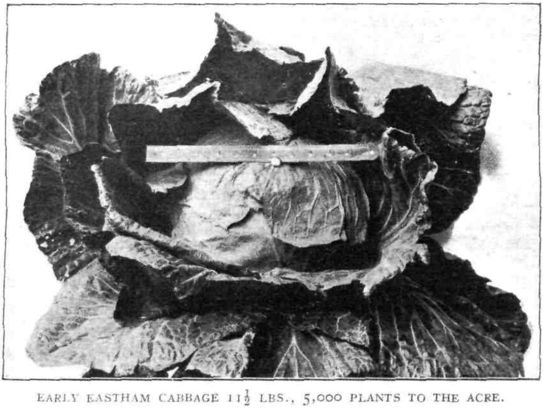
The whole of the farm work is carried out by Mr. Lowe and his two sons, except during harvesting, when a casual hand is employed. Within a radius of 15 miles of Bendigo, there are thousands of acres of waste lands similar to this farm, which are eminently adapted for dairying and intense culture. In its unimproved state it does not look very inviting, but I am convinced, after inspecting this farm of Mr. Lowe's, that, with the aid of water and manure, and not a great deal of labour, that this vast wilderness could be converted and transformed into smiling and lucrative dairy farms. This would give employment to thousands of men, who, if these now waste lands were thrown open, would be comfortably settled and enabled to earn a livelihood, besides helping to maintain and build up the city of Bendigo.

B.—A SUBURBAN HOMESTEAD.

One of the most striking instances of what one man can accomplish successfully by systematic rotation of crops came under my notice lately when inspecting Mr. Leonard Fairhall's dairy herd at Burwood. The farm in question consists of 10 acres of land, composed of grey sandy loam, with a red clay subsoil. It is sub-divided into three paddocks, varying from 2 to 5 acres. The whole is drained by underground pipes, Mr. Fairhall attributing a good deal of his success to thorough drainage. Five acres are devoted exclusively to intense cultivation. The balance is sown down with grasses, and grazed by the dairy herd. The farm has been carrying 13 cows in full milk, three dry cows, and one horse, the dry cows coming in at varying times of the year, and keeping up the milk supply. The cows are in splendid condition, rather larger-framed than the general run of herds, and of robust constitution. They are milking at the present time 112 quarts daily: 80 quarts are sold wholesale at 7d. per gallon on the farm, the balance being separated, and returning 21 lbs. of butter weekly, which is sold on an average of 1s. per lb. all the year round. The milk payments are £8 3s. fortnightly, and with the sales of butter bring the monthly returns from the 13 cows to £20 10s.

The only feed purchased outside the crops grown on the farm is star branning, which is used at the rate of one bag per week, at a cost of 3s. 6d. per bag. It is mixed with the green chaffed fodder. Mr. Fairhall does not believe in carrying all his eggs in one basket, and always has a crop of vegetables for sale coming on. At the present time there are ½-acre of carrots (James intermediate and Belgians), ½ an acre of millet and amber cane, 1 acre of maize, and 1½ acres of oats. As soon as the crops

are harvested, the land is manured at the rate of 12 loads of farm-yard manure (all produced on the farm), and ½ cwt. of superphosphates to the acre, the ground being thoroughly tilled and brought to a fine tilth before sowing. The maize crop sown in March was 5 feet high, and ready for cutting in June; it grew to a height of 6 feet, and fed the whole of the animals during that period, and was fed at the rate of four loads each day. The land was immediately re-sown with barley. There are also 2½ acres of oats and ½ an acre of cabbages (early Easthams), at the rate of 5,000 plants to the acre. The cabbages were an enormous size at the time of my inspection, and the owner informed me that three plants were a sufficient meal for one cow, as they weigh from 8 to 12 lbs. each. The owner expects crops sown at present to yield ample feed for his cows right up to the winter. During the summer months, starting from January, he irrigates the cultivation crops by gravitation with the



EARLY EASTHAM CABBAGE 11½ LBS., 5,000 PLANTS TO THE ACRE.

Yan Yean, using 10,000 gallons, at a cost of 10s. per week, giving the land a thorough weekly soaking until March. Besides keeping the herd, the owner, for two months, sold parsnips, returning 15s. per week. All the calves are kept for a few weeks, and then sold at 8s. per head. Eight pigs, which cost 5s. each as suckers were fattened and sold at 27s. each. In season the owner always has a crop of onions, carrots, parsnips, cabbages, French beans, potatoes, gooseberries, and rhubarb, and the present crop of the latter is very advanced, owing to repeated applications of liquid manure, caught in a pit from the milking shed. The cows are fed in the open, and appear to be thoroughly contented. The homestead and farm buildings are neat, and one receives, upon entering the premises, an impression of contentment and prosperity. The receipts are at least £250 per annum, which, from so small an area, must be regarded as very satisfactory. The rent paid is £40 per annum.

FARM-FED PORK AND VEAL.

A. A. Brown, M.B., B.S., Inspector of Foods for Export.

A few weeks ago I paid a special visit of inspection to the auction-rooms of Melbourne where dead meat, killed by farmers on farms in all parts of the country is consigned and sold. As regards pigs, many carcasses were very poor, and brought only from 2d. to 1¼d. per lb. On the other hand, prime porkers brought from 5d. to 5¾d. per lb. The poor carcasses that brought only from 2d. to 1¼d. per lb. were evidently derived from pigs that had been grass fed or fed upon skim milk, and it should be firmly impressed on farmers that there is no profit in forwarding inferior pork to the markets of Melbourne. To fetch payable prices pigs should be well fed, and, if allowed to roam at large, they should be run on lucerne paddocks. Lucerne is the king of fodders for pigs to graze upon, and it has a nutritive ratio of as 1 : 2 .3, that is, there is 1 lb. of digestible proteid or nitrogenous compounds to every 2.3 lbs. of carbohydrates (sugars and starches). Rape is also a good crop over which pigs should be allowed to graze, but it has not the same value as lucerne, since its nutritive ratio is as 1 : 5.7, and is somewhat too wide. To fatten pigs in a proper fashion, and secure firmness of flesh and fat, a ratio of 1 lb. of digestible proteid to every 4 lb. of digestible carbo-hydrates is what should be aimed at. If carbo-hydrates prevail largely in the ration, the flesh and fat are soft, and pigs so fed do not make prime bacon. The chief concern in feeding pigs is to keep the animals upon a narrow ration, that is narrow as regards the quantity of proteid to the other constituents. It will be found in actual practice that if a highly nitrogenous ration is given, the other constituents (sugar, starches, and fats) will be found present in large enough quantities to meet all the requirements of the animal.

Peameal, or oatmeal, or beanmeal should prevail in the rations of every young pig, and the food should be given in skim-milk, or butter-milk, warmed to 100 degrees Fah. With older animals a diet in which any one or more of the following foods, which are all rich in nitrogen, and in which the nutritive ratio is as narrow as is required should prevail. Peas, whole or crushed, beans, whole or crushed, pollard, oats, brewer's grains, cocoanut-meal, sunflower seed, and rape-seed meal, given in skim-milk or butter-milk, should be regularly fed. Cotton-seed meal, or linseed meal might be occasionally given with advantage. They are laxative in action as well as being rich in proteids.

Pigs also require plenty of wood ashes and ground green bone, or bonemeal in their rations. The rations should be plentifully supplied, quite up to the limits of capacity, since it is required to produce small carcasses as quickly as possible, and then when the pigs attain a certain weight, they should be instantly disposed of. Quickness in getting the porkers ready for market should be the aim; and conducting operations on these principles will give large profits. Somewhere about 400 lbs. of any of the foods above mentioned will put 100 lbs. live weight on a pig.

Some little time before slaughter pigs should be penned up and topped off. A highly nitrogenous diet is absolutely essential in imparting firmness to the fat and flesh. It is quite easy to determine carcasses that have been fed largely on carbo-hydrates. From the outset of existence pigs should be well fed. If they should happen to get a set back just as they are starting

life, it takes a long time to overtake and repair the damage. Whole milk is the best food for very young pigs. In the absence of whole milk, skim milk and linseed meal or oatmeal make a good diet.

At one of the auction rooms pork from Tasmania was sold, and realized top prices. This pork was derived from pigs that had been well fed, and there were not many carcasses about that could compare with them.

To realize top prices carcasses should weigh between 60 to 80 lbs., and should be well bled and then well dressed. Prime porkers always fetch more than bacon pigs. Bacon pigs, well fed and fairly well dressed, brought from 4d. to 4½d. per lb. They should weigh 120 to 160 lbs. It is not advisable to send carcasses of pork or veal to Melbourne in the beginning of the week. These commodities should be sent away Thursday, or Thursday night, for Friday's market, as the sales start at 10 o'clock on Fridays. The chief demand for veal and pork is at the end of the week, and no farmer should fail to note these observations. These observations are based on actual experience of the conditions prevailing in the meat markets of Melbourne.

Dressing Pigs.

Very few farmers would seem to possess a sound knowledge of the technique associated with the killing, scalding, and dressing of pigs for market. Some scald their pigs in water far too hot, thus reddening the skin and so depreciating the value of the carcass. Many such carcasses brought only 4¾d. per lb., whereas if they had been properly treated they would have brought 5d. or 5¼d. per lb. Again others do not scald with water hot enough, since the dehairing is noticed to be defective. The temperature for scalding is about 160 degrees Fahr., and this temperature is roughly attained by mixing three buckets of boiling water with one of cold.

The carcass of the pig after it has been stuck and bled is immediately thrown into the scald, and kept in motion in the hot water. It is kept in motion by seizing hold of the nose, and then twirling it round and round. This movement is kept up for fully five minutes before commencing to scrape the carcass. After being scalded the carcass should be shaved (that is thoroughly scraped) in the hot water. When that operation is complete the carcass should be thrown into a tub of cold water, and there the head and feet should be completely shaved; it is then removed from the cold water tub and hung up, and again scraped. After being again thoroughly scraped the belly is opened from the aitches to near the tip of the lower jaw. Then all the entrails are removed, and the inside and also the outside of the carcass washed well with clean warm water. No blood stains should be allowed to remain on the carcass. As a last washing cold water should be thrown over the carcass. Now it should be scraped with a piece of clean bent hoop-iron, so as to remove all water adhering to the carcass, and finally it should be well rubbed with a dry cloth and rubbed dry, and a belly-set put in position. It should, when all the operations are completed, be hung in a place which is well ventilated, but free from draughts. If hung in a draughty place, and more particularly if the carcass be very moist, it will turn a reddish-yellow colour, sometimes even presenting the appearance often observed in pigs just recovering from an attack of swine plague. When set, and just before despatch to the railway, each carcass should be encased in bagging material. New material should always be used for this purpose.

Calves.

With regard to calves it is not much use sending poor ill-fed carcasses to the meat market, as they are unprofitable to the sender. Calves should be fed for some ten days after birth upon whole milk, and then gradually fed upon skim-milk, to which linseed meal or oatmeal is added to make up for the fat deficiency. They should not be killed less than six weeks old if one wishes to realize good prices. At this age they should weigh from 50 to 80 lbs. in their jackets, depending upon the breed. On examining calves in the auction room one cannot fail to be struck with the general poverty prevailing in their condition. Carcasses of calves well fed, last Friday (31st August), brought 3d. per lb., ill-fed carcasses, however, only realized 1½d. per lb. The carcasses are usually badly bled, roughly washed, and packed in bagging before the animal heat has dissipated.

On being slaughtered the carcasses should, after being disembowelled, be completely washed of all blood stains, and on no account should the incision be sown up. The carcasses should be belly-setted and allowed to cool, and then after being set should be bagged in new clean material. The head and feet should be cut off and used on the farm; these portions of the carcass are removed in Melbourne and sold separately, and only fetch 2d. to 3d. per set (feet and head). No calves should be brought in from wet paddocks and immediately slaughtered, but should be allowed to get dry and then dealt with. When slaughtered with their skins wet they do not present an inviting appearance.

PRESERVATION OF MEAT.

A. A. Brown, M.B., B.S., Inspector of Foods for Export.

Salting.

The preservation of meat by the agency of salt (Sodium chloride) is one of the oldest and most widely-used processes. Salt acts partially as a dehydrating agent—that is, it deprives the meat of water—and partially as an antiseptic. In salting meat to preserve it from decay, various methods are employed. Some preservers adopt one method, some another. In order that any process may be successful, attention must first of all be directed to the slaughtering of the animal whose carcass it is intended to preserve. A cool day should be chosen for the slaughtering; the animal should be well bled, and, after having been carefully dressed, the carcass should be allowed to hang in a cool place until the animal heat has dissipated. This condition is indicated by the carcass setting firmly. After the carcass has set it should be cut up.

There are various ways of salting meat, and any of the following will give successful results:—

1. For each 100 lbs. of meat, employ a thoroughly incorporated mixture of 8 lbs. of Black Horse salt, 3 lbs. of granulated sugar, and 4 oz. of saltpetre. Rub the meat to be treated on all surfaces with one-third of the mixture, and then pack it in a barrel. Let it remain there for three days; then take it out, and rub it again with another one-third of the salt mixture. In putting the pieces back into the barrel, place those that were previously on top at the bottom of the vessel. At the end of another three days take the meat out again, and rub it with the last one-third of the mixture. Three days after this the meat will be cured. Now

take it out of the barrel, place it on a board over the barrel, and allow it to drip into the barrel for a day or two. It can be used when partially cured, as occasion demands, at any point previous to this stage, if the preserver so wishes. If it is now required to keep the meat still longer, it should be rubbed over with a little dry salt, and when dry it should be smoked. The process of smoking greatly assists in the preservation of meat, partly on account of the drying action of the heat associated with the smoking, and partly through the antiseptic action of some of the substances in the smoke. The best substance to use to make a dense smoke is the finest New Zealand pine sawdust (Kauri pine). The preservation of the meat in hot weather is also greatly assisted by adding to the brine formed during the process a little sodium sulphite. Add for every 100 lbs. of meat half an ounce of sodium sulphite to the brine. The liquid that is found in the barrel during the process should not be removed, but the meat should be repacked in it each time it is taken out from it.

2. A second method consists in placing the meat in casks in layers, with salt between each layer. The salt withdraws water from the meat, and the brine that is formed penetrates the substance of the flesh.

3. A third method consists in pumping a strong solution of salt, by means of a brine pump, into the arteries. This method I have demonstrated to butchers, and is a rapid and effective way of preserving meat.

Any farmer, however, can employ methods No. 1 and No. 2; and, if he treats fresh flesh on a cool day as directed, he will get successful results. The use of water in making a pickle should be avoided, since the water supply on a farm is usually contaminated with micro-organisms that rapidly cause putrefactive changes in flesh. If, however, curing by brine is desired, about 3¼ lbs. of salt should be added to every gallon of water, and the water should have previously been boiled. The brine made on adding the salt to the boiled water should be filtered through a double fold of cheese-cloth, to remove various impurities. The pickling barrel should be kept in a cool, well-ventilated place.

Bacon Curing.

Kill the pig on a cool day by sticking it in the throat, just above the breast-bone, in the mid-line; then incline the blade downwards and backwards, still sticking to the mid-line, and the large blood vessels will, if the operation be carried out as directed, be severed, and the pig will then properly bleed. Then, when bled, plunge the carcass into a capacious vessel containing hot water made by mixing one bucket of cold with three of boiling water, which will give a temperature of about 160 deg. Fahr. The carcass must be plunged into an abundance of hot water, and, when it is in the tub, move it about for fully five minutes by seizing hold of the nose. Scrape it well in the hot water, and, when scraped, plunge it into a tub of cold water and scrape it again, removing all hair from the carcass, and cleaning the head and feet thoroughly. Any hair that does not readily come away should be shaved off with a sharp knife. Then hang the carcass up, open it, remove entrails, and wash it well with warm water, and afterwards with cold water. Dry it well with good clean rough cloths, and allow it to hang in a cool place, free from draughts, until the animal heat has left it. If hung in a draughty place, the carcass will turn a yellowish-brown colour; so avoid hanging in draughts. After the carcass has set it should be cleanly divided by cleaving or sawing down the spinal column; then the back-bone, and also the shoulder-blades should

be removed. The sides should be well trimmed, and each side should be thoroughly rubbed over with 5 lbs. of salt to every 100 lbs. weight of meat. The sides should, when all this has been completed, be laid in the pickling tub, and allowed to remain there for, say, two days. They should then be removed from the tub and placed on a table. The brine should be thrown away, and the pickling tub thoroughly cleaned. A mixture of 5 lbs. of salt, 2 lbs. of sugar, and 2 ozs. of saltpetre should be thoroughly incorporated by rolling with a rolling pin. Each side should be rubbed with the salt mixture, and placed back in the pickling tub; but, before being replaced, the blood veins should be removed. On each alternate day take out the sides, and rub them well with more of the salt mixture, and replace the sides in the tub, taking care that those that were previously uppermost are now placed at the bottom of the tub. Continue this rubbing and changing of the sides for twenty-one days, and at the end of that period they will be cured. When finally removed from the tub, the sides should be plunged into hot water for a few minutes, scrubbed, and then immersed in cold clean water (as cold as can be procured) for four hours, and afterwards thoroughly dried by rubbing with clean cloths. Wipe out the pockets made by the removal of the shoulder-blades with a weak solution of formalin, so as to prevent slime and moulds forming there, and then rub in a little sodium sulphite. Rub the sides over with oatmeal or maizemeal containing a little sulphite of soda, hang them up to dry, and when dry smoke them. When smoked, encase them in a covering of cheese-cloth, to keep away flies. In very hot districts the whole side could with advantage, after being taken out of the cold water, be plunged into a solution of sodium sulphite, to further assist its preservation. A solution of 3 ozs. to 10 gallons of water will be strong enough for the purpose. If necessary, the sides can be cut up into hams, shoulders, and middles, and the pieces treated as directed for the sides. The middles would be cured in about sixteen days. The amount of salt that is taken up during the curing process varies, but it ranges from about 6 to 8 lbs. per 100 lbs. of meat.

Bacon sold in the markets is not now allowed to contain more than .125 per cent. of saltpetre, and so definite quantities should now be used in the curing process. Decolourization occurs as one of the results of salting meat, and it is the custom amongst preservers to add a small proportion of saltpetre to counteract this. Saltpetre not only restores the colour, but acts as a preservative.

In curing bacon, where a brine pump is procurable, it is a thoroughly scientific method to inject into the arterial system a saturated solution of brine. The brine forces out all blood in the blood-vessels, and penetrates everywhere. It goes even into the tissues of the bones themselves. This method would put an end to bone-taint, and bacon curers should generally adopt this way of getting rid of blood from the carcasses.

The feeding of pigs intended for bacon purposes is a matter demanding great attention. All animals should be well and properly fed. The great majority of pigs slaughtered for bacon purposes is unsuitable for the trade, since they have not been satisfactorily fed. To make prime bacon, highly nitrogenous foods, such as lucerne, rape, oats, peas, beans, clovers, pollard and milk, peameal, beanmeal, &c., should be regularly fed. If other products exist about the farm which it is desired should be converted into bacon, the fact that nitrogenous foods are absolutely essential to the making of good bacon should not be lost sight of. If any of the starchy foods, such as maize, have been fed to pigs during

their early life, then, for some six week before slaughter, the diet should be highly nitrogenous. The nitrogenous diet impresses firmness on the fat and flesh, and animals so fed can be readily diagnosed.

FEATHER EATING.

H. V. Hawkins, Poultry Expert.

An inquiry from an amateur poultry breeder as to the cause of feathers falling out under the neck of the cockerels belonging to him has been referred to me for reply. As there are doubtless other owners experiencing the same trouble with their poultry, I have deemed it advisable to reply at length, especially as the inquirer states that the same thing occurred last year.

There are many reasons why feathers come out, but the cause in this particular case would appear to be that the mischief is due to the lack of nitrogen available in the food supply. All laying hens crave for nitrogenous foods, particularly at this time of year, when they are at their highest pressure—*i.e.*, laying heavily. By careful observation, it will be noticed that the hens will pick at the juicy young feathers on the neck of the male birds. Gradually the thirst for blood increases, and probably several of the hens will attack his neck hackle until it is quite bare and reddish-looking; often the comb of the cockerel is attacked, and once blood is drawn, they keep on picking at the same spot, gradually creating a cavity at the base of comb. Strange to say, it has a hypnotizing influence on the male bird, who rarely objects to the treatment; in fact, he will hold his head down, and go off to sleep, while several of his mates dig away, and enjoy the protein which the comb supplies, much to the annoyance of the owner, who realizes too late that the one-time beautiful, upright head-piece on his Minorca or Leghorn has been seriously injured. Gradually it is seen to slightly fall, and the friction caused by the comb leaning to one side creates a deep wrinkle, a cankerous growth sets in, and the comb of the cock is completely ruined. When a case occurs, it is always desirable to dub the comb—*i.e.*, cut off with a sharp razor—otherwise he will practically starve in the pen, and the fertility of the eggs will be in great danger.

The remedial measures are—First, keep the cockerel away from the hens the greater part of day, allowing him to be with them only half-an hour morning and afternoon. Second, add to meal 1 oz. (per hen) of *animal* (protein) food daily—*i.e.*, sheep or bullock's liver or heart, or, what may often be obtained for nothing, wild rabbit; soak over night, and lightly boil, using the soup in mixing the pollard (two parts) and bran (one part) meal; or a sheep's head or a portion of liver may be hung up in a net suspended 2 feet from the ground. This will give the hens exercise, and provide their wants. The same practice may be followed with a cabbage, which at this time of year is especially needful in supplying the mineral salts so necessary to the laying hen. Don't give *too much* grain; it tends to dry up the system, and a scurvy skin, with liver troubles, eventuates. Remember, fowls are not granivorous, but insectivorous. Supply the substitute (animal food, &c.), and you will find your flocks satisfied, and the eggs strong in the embryo, resulting in chicks with greater stamina.

THE CURRANT.

James Lang, Harcourt.

The currant succeeds best in the cooler districts of the State near the Dividing Range. It also does well in some of the other districts, where a good rainfall is assured, provided the garden soil is good and well drained.

Propagation.

Currants are propagated by cuttings and layers, although this latter method is very seldom resorted to. Strong, clean shoots of one year taken from the plants should be cut into lengths of from 12 to 15 inches long, the base of the cutting being cut off square with a sharp knife just below a bud. The buds should then be cut out with a knife, leaving the four top buds to form the branches; if the buds are taken out clean, it will prevent the plants from throwing suckers. In planting the cuttings, they should be put in rows 2 feet apart and 6 inches between the cuttings; insert them in a slanting direction about 9 inches deep, leaving the buds above the surface. The cuttings should be trodden in firmly, especially at the base. Keep the ground well hoed and free from weeds during the growing season, and they will be fit for planting out the following winter.

Preparing the Ground.

In making a currant plantation, see that the plants are placed in a plot by themselves, as it is a mistake to put them amongst orchard trees. The ground should be deeply ploughed to an average depth of 8 inches during the spring, and allowed to lie fallow throughout the summer, with an occasional stirring up with the scarifier to keep weeds down. About the end of March or beginning of April, the land should be again ploughed and harrowed level; it will then be fit for planting.

Planting.

The plants should be planted in rows 6 feet apart and 6 feet in the rows; this gives plenty of room for working the ground with the horse. In preparing the young plants for planting, any roots that may be growing too high up on the stem should be cut off, leaving 6 to 8 inches of the stem clear. Plant out in holes prepared for them; these should be about 18 inches in diameter. The soil in the centre of the hole should form a little conical heap, the point of the heap being about an inch below the surface. Place the bottom of the plant on the centre of the heap, and spread the roots equally all round; then put in a couple of spadesful of soil over the roots, and tread firmly. Put in the rest of the soil, and tread again, being careful not to put the plants in too deep.

Cultivation.

The after cultivation of the plants will be ploughing with a small plough between the rows, throwing the furrows up to the plants. In this way you will leave a furrow down the centre to carry off surplus rain; this should be done before winter. Plough the reverse way in spring, and harrow; this leaves the ground perfectly level again. The horse hoe will require to be run up and down a few times during the growing season, to keep the soil open and to destroy weeds.

11012

PRUNING.

The three or four branches on the young plants should be shortened back to 2 or 3 inches from the stem, and the following year they should be cut back again, leaving about one-third of the young shoot. In pruning back the main branches, always cut to an outside bud, as the plants are of an upright habit of growth. For the third and succeeding years, the pruning will be much the same. Keep the centre of the bush clear of all surplus growths, and as the bush develops allow more branches to grow; see that they are well spaced, and do not overcrowd each other.

Red and white currants keep a long time on the bush after they are ripe, if the birds leave them alone, so that the marketing of the fruit can be spread over several weeks. The best varieties are La Versaillaise, Bertyn's No. 9, Houghton Castle, and White Dutch. White currants do not sell so well as the red; the latter should be planted in much greater quantities than the white.

The fruit of the black currant requires to be picked as soon as ripe; if left too long it drops from the bush. The best varieties are Black Naples, Carter's Black Champion, and Lee's Prolific Black.

FRUIT PRESERVING.

Miss A. Mendoza, Fruit Preserving Expert.

The preserving of fruit is, perhaps, one of the most simple operations in domestic economy, yet few people care to undertake it without some little instruction, and it is with a view to providing this that these brief instructions are written.

Bottles.—All fruits may be preserved in bottles or tins. The selection of bottles is a matter of importance, as there are many faulty kinds on the market. Their defects sometimes render the whole operation abortive. For example, when they are made of badly-tempered glass, the bottoms drop out when heat is applied, generally when the lid is being put on; and again, in others, owing to badly-fitting lids, the exclusion of the air is impossible. Glass, when heated as in fruit bottling, warps in cooling; the pressure on the rubbers when the lids do not fit is therefore uneven, and the air is admitted. As the contents of the bottle cool, a vacuum should be created; without this, the preservation is imperfect, and may cause mould or fermentation.

The following particulars of the bottles illustrated will be helpful to those desirous of engaging in fruit preserving. The numbers are those indicated on the plate. It is interesting to know that, of the bottles enumerated, Nos. 1, 2, 3, 5, and 8 are made at the Melbourne Glass Bottle Works; Nos. 6 and 9 are also colonial products.

1. Atlas—Quarts and Pints.—This bottle is made with a wide mouth, in order to take large whole fruit. A good bottle for any purpose, and excellent for show work.

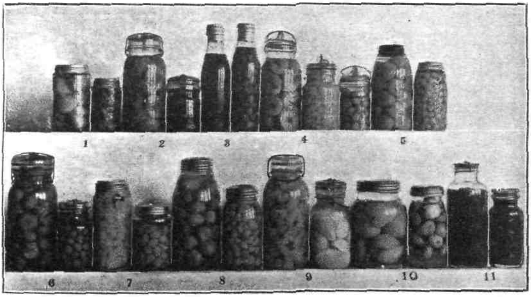
2. Chicago—Half-gallons, Quarts, and Pints.—A good serviceable bottle for all purposes, and when made in white glass is excellent for show

purposes. It has a fairly large mouth, which admits of the fruit being well packed.

3. This is the old English fruit bottle, with cork stopper; and, for small fruit, such as cherries, gooseberries, currants, &c., is very suitable. The only drawback is the cork; but supplies are procurable from any cork merchant. The bottle is cheap, and easily manipulated.

4. Canton—Half-gallons, Quarts, and Pints.—This is an American bottle. It is a good clear white glass, and well tempered. It has a very pleasing look, but the mouth is somewhat narrower than Nos. 1 and 2. The Canton bottle is expensive, and for domestic use is no better than any other, although its beautiful clear glass commends it. It is not always procurable, being imported in limited quantities only.

5. Mason.—This jar is made in all sizes, and is so well known as to require no special description. It is the cheapest, and said by some to be the best bottle in use.



TYPES OF BOTTLES USED FOR PRESERVING FRUIT.

6. Commonwealth. — This is a good wide-mouthed and serviceable bottle for all purposes.

7. Is a class of bottle used largely in England. The New Zealand fruit preserving expert, who kindly supplied the specimen illustrated, speaks highly of it. As far as I am aware, it is not procurable in this State.

8. Mason's Improved.—This bottle which resembles the Atlas somewhat in shape, is a good kind. The improvement consists chiefly in the method of fastening the lid; the glass top is laid on, and a screw band draws it down, so that no metallic substance can ome in contact with the fruit.

9. Lightning.—This resembles No. 2, but has a much narrower top. The bottle is a good one, but not so convenient for packing as some of the others. It is colonial made, and somewhat largely used.

10. This is an imported jar, wide-mouthed, and good for preserving whole fruit; but my experience leads me to say that it is defective in the tempering, as a large percentage breaks during the heating process. It is not largely used, on this account.

11. This jar was sent from England to show the method of bottling there. It will be noticed the lid is tightened down with a clamp, by means of a worm cast in the glass; the mouth is small, and there is no improvement in any way on the ones already described.

Rubbers.—These also are at times faulty. As a rule, cheap, inferior rubber, or composition, is employed, and when the necessary pressure is applied, as it should be, whilst the fruit is hot, all elasticity is taken out of the rubber, and it fails to act as intended. In all cases the best quality of rubber should be employed.

Fruits.—Apricots and peaches are best prepared by removing the pith or stone, the fruit being cut with a sharp knife to avoid tearing. If desired, the fruit may be preserved whole, by cutting half-through and removing the stone. The cut will then close up, and the fruit present a whole appearance; but much more fruit may be placed in the bottles, or tins, when cut in halves than when whole, and for all purposes, except

BOTTLING BEFORE STERILIZING.

appearance, this method is more convenient and profitable. Plums require no other preparation than cleaning by rinsing in cold water. Apples, pears, and quinces should be pared, cored, and cut in sizes to enter the bottle. When peeled or cut, they should immediately be dropped into a brine (about 1 lb. of salt to 1 gallon of water), and allowed to remain until all are ready for bottling. This prevents oxidation or discolouration. The fruit may be afterwards rinsed.

Methods of Preserving.

Bottling before Sterilizing.—There are two methods of sterilizing. The first is to fill the bottles with raw fruit, as shown in the above illustration. Pack the fruit well, then fill up the bottles with cold syrup or water, and sterilize by placing in a bath of water or steam. If water is

employed, place the bottles in a boiler, fill it with water to the neck of the bottles, and bring to a boil. Continue to boil until the fruit is sufficiently cooked for table use, when the lids, corks, or stoppers should be fastened down whilst the bottles are standing in the boiling water or steam. If the fruit has shrunk in boiling, one bottle may be taken out and the others filled up from it whilst boiling; if this is not done, boiling water or syrup should be poured in until bottles overflow, by which means any scum or air bubbles which may have risen to the top are floated off. If the bottles are lifted out whilst hot, care must be taken to stand them on a wet hot cloth, and, by covering up until cold, prevent cold draughts striking them. Most people allow the bottle to cool down in the bath, which is the safest plan.

The second method is the steam bath, which consists of placing the bottles, when full, in a boiler or copper, standing them on a board which may be termed a "false bottom." This board should be kept an inch or two from the bottom of the vessel, which contains water to create steam for cooking the fruit. The bottles should not stand in the water, but above it, on the false bottom. The lid of the vessel should be put on. In cases where the ordinary washing copper, or any open vessel, is employed, a coarse close cloth, such as a corn-sack, may be thrown over it, so as to confine the steam. This system is much more convenient than the water bath, as the cover can be removed and the contents examined, and, if not sterilized, it may be again covered up and the process continued. There is much less heating power required, the changes are easily effected, and the work is carried on continuously. The treatment of the bottles is similar to that of the water bath. These two systems of sterilizing are usually employed when appearance is a consideration, as the fruit can be packed in all manner of ways to suit the taste of the operator.

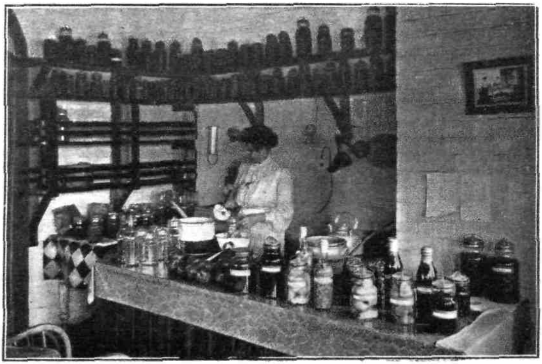
Open Pan System.—For domestic use, the open pan system, illustrated below, answers equally well, and saves trouble. Place the fruit in a stewpan, and boil in syrup or water, as if for table use, but slightly undercook. Then stand the bottles in a vessel containing hot water, ladle out the boiling fruit, and fill the bottles. This may be done with a wire ladle, so as to take nothing up but the fruit. The bottles are then filled up with clean, bright, boiling syrup or water, and the lids fastened down immediately. Several lots may be boiled in the same syrup, which is equally good for placing in the bottle, if desired; but fresh, clear, bright syrup gives a better appearance. This system is simple and effective.

The following points must be carefully observed:—The bottles must be quite full before the lids are fastened down. The lids must be properly fitted, as described, and sterilized, before being placed in position, by dipping them in boiling water or some preservative; hot water is simplest and best. The rubbers should be served in a similar way. The lids should be fastened immediately the boiling syrup or water is poured in. Each bottle should be filled up and shut down separately. In no case should the temperature in any portion of the inside fall below 180 deg. F. before being properly closed down. Neglect in this respect is accountable for most of the disappointments met with by amateurs and others.

Syrup.—Sugar plays no part in the preserving, and is used for flavoring only, and the strength of this must be regulated by the taste of those by whom it is to be used. Fruit preserved in syrup is termed dessert or table fruit, whilst that put up in water is known as pie or culinary

fruit. Both are equally preserved, and serve the purpose for which they are intended. The syrup usually employed is made by boiling in the proportion of one pound of sugar to one quart of water. Bright cane sugar is the best; it should be boiled for a short time, and the floating scum skimmed off. The syrup may be made in bulk, and kept for use as required. Refined or loaf sugar will give the best results, and is very little more expensive; filtered water, if available, should be used. With loaf sugar and filtered water, no boiling or skimming is required beyond sufficient to thoroughly dissolve the sugar.

Bottled fruits should not be exposed to strong light when stored, as it has a bleaching effect and destroys the colour. If kept cool, they will retain their flavour better than when stored in a high temperature; but when properly sterilized, and the air is excluded from the bottles, no



OPEN PAN SYSTEM.

further change can take place, so far as the preserving is concerned, and all depends on the effective manner in which this has been done.

Canning.

This system of preserving is not generally employed by householders, but immense strides have been made in factories, both in preserving vegetable and animal products. The cost is much less than in any other method employed, and tins are more easily handled than glass. The difficulty of soldering up the tins appears to be the objection, but very little practice overcomes this. Fruits may be put up in tins in the form of pulp, jam, or preserves. The preparation of the fruits is similar to that of bottling. The tins are filled with fresh fruits and packed firmly, the syrup or water is added, and the stud soldered down, leaving the vent open. The tins are then placed in the boiler, and boiled similarly as in bottling. When partly cooked, the vent is soldered up, and the tins reboiled. The time required for boiling is regulated by the size of the tin, and also the kind of fruit under treatment. A little experience will soon

show what is required in this respect. For preserves the usual-sized tin holds about two pounds. In pulp all sizes are used; ten pounds is, however, considered the best. For jam all sizes are employed. Where the soldering difficulty can be overcome, tins will be found less costly and more convenient. Solder and soldering solution can be obtained at most ironmongers', whilst 2-lb. tins may be purchased at about 12s. to 14s. per gross. Bottles with the same capacity cost from £3 to £5 per gross.

These brief instructions are intended for the amateur only, and space will not permit of details being gone into. Information of this class is much needed, and the subject may be treated more fully later on. It is hoped that the advice given will help those who desire to give fruit-preserving a trial.

Pulping for Domestic Use.

The pulping of fruits is one of the simplest of all operations, and will be found an easy method of providing cheap and wholesome fresh fruits of all kinds. Pulp may be used for culinary purposes or jam-making whenever required. The pulping consists of simply boiling any kind of fruit which can be used for jam-making or any other methods of utilizing fresh fruit. The fruit is placed in a boiler without water, or, at least, with just sufficient water to cause the juice to run so as to stew the fruit in its own moisture. When boiled sufficiently soft, not necessarily to a pulp in the ordinary sense of the term, but sufficient to sterilize it, it can be placed in bottles in the manner described for the open pan system of preserving. Nothing in the way of sugar or other matter is added to it.

DESTRUCTIVE BIRDS.

C. French, junior, Assistant Government Entomologist.

Amongst the losses the farmer, poultry-keeper, and orchardist have to contend with in this State are the depredations committed by destructive birds. In farming districts numbers of the eagle and hawk family of birds (*Accipitres*, birds of prey) cause considerable losses by their destruction of valuable poultry. The following birds are the chief culprits, namely:—Collared sparrowhawk (*Accipiter cirrhocephalus*), black-cheeked falcon (*Falco melanogenys*), brown hawk (*Hieracidea berigora*), swamp hawk (*Circus gouldi*), whistling eagle (*Haliaster sphenurus*), &c. In various parts of Victoria, especially in the Mallee district, the wedge-tailed eagle, or eaglehawk (*Uroætus audax*), is very destructive to young lambs. Crows, like the last-mentioned bird, are a source of anxiety to sheep-owners, for when lambs have fallen, owing to weakness or other causes, the crows pick their eyes out. They are also fond of all kinds of eggs. Though a destructive bird, the crow has also its good qualities, as it consumes immense numbers of that dreaded pest, the locust.

In the fruit-growing districts the orchardists have much to contend with, not only with our indigenous birds, but also the introduced ones. The starling (*Sturnus vulgaris*), for example, is a most pernicious enemy to the fruit-grower and viticulturist in this and other Australian States. These birds are increasing many times faster than their natural food. The principal fruits destroyed in Victoria by the starling are as follow:—Peaches.

pears, cherries, apricots, grapes, apples, tomatoes, &c., &c. The English blackbird (*Turdus merula*) is another introduction from Europe. There it is looked upon as insectivorous; but here, like the starling, it has taken to eating fruits. In and around Melbourne it is now difficult to get ripe figs, grapes, and peaches, owing to the depredations of the blackbird and its ally, the thrush. The house sparrow (*Passer domesticus*) and Indian minah, or mynah (*Acridotheres gingimianus*), are also introductions. The former bird is particularly fond of figs, grapes, and other soft fruits. The house sparrow, to the farmer, needs no introduction, as its depredations, are, unfortunately, only too well known. It eats quantities of wheat soon after it is sown, and, as the grain ripens, flocks of sparrows may be seen clinging to the ears of grain, whilst they pick out the corn.

Many parrots, parrakeets, and cockatoos are also very destructive to grain, the great sulphur-crested cockatoo, or white cockatoo, probably being the worst offender in this respect. In our own State we unfortunately possess a fair number of fruit-destroying birds, and most of the orchardist's time is taken up in the endeavour to protect his fruit. Many devices have been tried to destroy these birds, but up to the present they have been almost failures. The olive-backed oriole (*Oriolus viridis*) causes a considerable loss to the orchardist by destroying a number of the softer varieties of fruit, such as peaches, grapes, strawberries, pears. That beautiful bird, the satin bower bird (*Ptilonorhynchus violaceus*), found principally in the heavily-timbered forests of Gippsland, destroys all kinds of fruit and the young plants of many vegetables. Several species of honey-eaters belonging to the genus *Ptilotis* are especially fond of fruit, grapes and figs being their particularly favoured fruits. The Australian minah (*Manorhina garrula*) is found in nearly every part of the State, causing considerable damage to the softer kinds of fruits, such as peaches, figs, grapes, &c. Honey-eaters usually feed on honey, which they extract from the Eucalyptus blossoms; but when soft fruits are ripe they are, however, very destructive in orchards. Many other birds, such as the warty-faced honey-eater (*Meliphaga phyrygia*), wattle bird (*Acanthochæra carunculata*), friar bird (*Philemon corniculatus*), Rose Hill parrakeet (*Platycercus eximius*), musk lorikeet (*Glossopsittacus concinnus*), and others are also causing immense losses to orchardists.

The white-backed crow shrike, "Magpie" (*Gymnorhina leuconota*), in some localities, especially in the Myrniong district, is accused of doing a certain amount of damage by eating the young crop as soon as it appears above ground. A friend of mine informs me that one day he counted 23 busily engaged pulling up wheat which had just come above ground, and it was with difficulty that the birds were driven away. Although this splendid insectivorous bird may occasionally destroy a little grain, it would be a sin to shoot it, as it is, without a doubt, the farmer's friend, as its chief food consists of grasshoppers, grubs, crickets, and a host of other injurious insects.

It is not often, that birds such as canaries hanging in cages, are destroyed by other birds, but in some of the country districts in this State it is impossible to hang a canary outside in a cage, owing to the butcher bird, or Derwent jackass, which is a persistent destroyer of these little household pets. At Clayton, near Oakleigh, a friend of mine lost four canaries in one afternoon through these birds.

Fortunately for us in Victoria, we have very few birds that damage trees, the only ones I know of that are at all troublesome being the Gang

Gang cockatoos (*Callocephalon galeatum*). On the Alps many of the limbs or branches of the "snow gums" (*Eucalyptus pauciflora*) are eaten nearly through, and dying, the cause of this being that the trees are attacked with the larva, or grub, of a Longicorn beetle (*Tragoceras lepidopterus*), and birds then tear the wood away to get at the grub. The white cockatoo (*Calopsittacus galerita*) and the black cockatoo (*Calyptorhynchus funereus*) are also fond of beetle grubs. On the Murray, Dandenong Ranges, and other parts of Victoria, many trees, such as the red gum (*Eucalyptus rostrata*) and giant eucalypt (*Eucalyptus amygdalina*) can be seen with fairly large holes torn out of the branches and butt, showing the trouble these birds must go to to obtain one of their fancied foods.

In New Zealand the kea (*Nestor notabilis*) attacks living sheep for the purpose of tearing out and devouring the kidney-fat, and inflicts injuries which prove fatal.

NOTE.—This essay was awarded silver medal at the Geelong Nature Study Exhibition, Easter, 1906.—*Editor.*

GARDEN NOTES.

J. Cronin, Inspector Vegetation Diseases Acts.

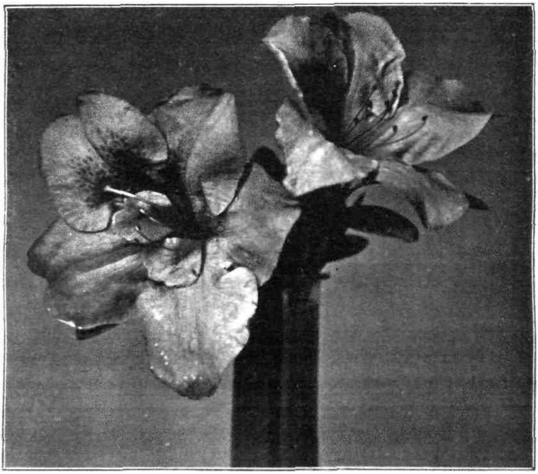
The Azalea.

The Azalea is a dwarf evergreen shrub, found native in China and India. The present types have been raised during the past century by hybridizing *a. Indica* and other species, the garden varieties being a great improvement on the original species. A large group of deciduous shrubs, natives of North America and the Caucasus, were, until lately, classed as belonging to the same genus, but are now included with Rhododendrons. This group is known to gardeners as Ghent Azaleas, from a town in Belgium, where they were largely grown when first introduced, and where many fine varieties were raised from seed. A few varieties of this class are cultivated in Victoria, but not as extensively as they deserve. They would be likely to thrive in the hilly districts of this State, where, in places, the Indian varieties are satisfactory. At Taylor and Sangster's nursery, Upper Macedon, a large collection of Azaleas has been planted in open beds, and the plants grow and flower splendidly. A more limited collection as regards varieties is to be found at Sir Edward Holroyd's residence, at Wandin; the kinds grown are chiefly the hardier single varieties, many of which are now fine large specimens that are a mass of beautiful bloom in Spring. These plants are never watered artificially, and do not appear to suffer in consequence, although other plants considered much hardier fail to thrive, owing to lack of moisture in summer. The aspect is easterly, the soil deep and porous, and by no means peaty—a supposed necessity for these plants. The fine bed of Azaleas at the Melbourne Botanic Gardens is grown in ordinary sandy soil, sheltered by palms and tree ferns growing amongst them, and also by a breakwind of large trees growing at some distance from the bed. Most of the plants in the metropolitan nurseries are grown in pots under trellis shelter, though in some places they succeed equally well planted out in beds under the

same shade conditions. Azaleas are plants worthy of a deal of care and attention, as they produce abundance of flowers of pure, bright, and graceful appearance that last well on the plants, or when cut for decoration, a purpose for which they are eminently suitable.

SOIL AND CULTURE.

The most suitable soil for Azaleas is a sandy peat, but any porous, well-drained virgin soil, that does not contain much lime, will suit them if the aspect is right. Azaleas resent lime, and manure, and the principal reason for failure is that they are planted in old garden soil, heavily impregnated with manure, lime, and carbonic acid. Another common cause of failure is deep planting. Azaleas are surface rooting, and should,

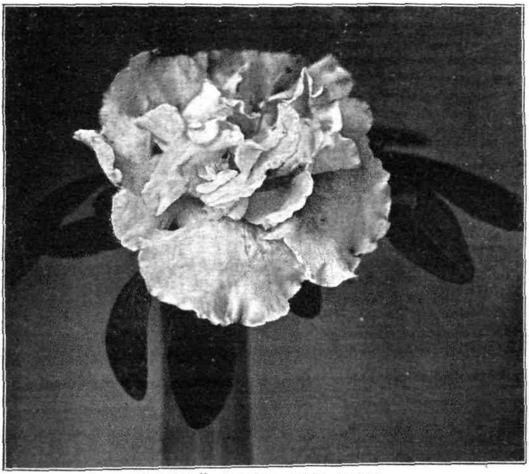


"CHARLES DE BUCK."—SINGLE, BRIGHT ROSY PURPLE.

when planted out, be placed rather above than below the mean level of the bed. The soil should be trodden firmly to prevent any settlement afterwards, and the bed thoroughly drained. A position sheltered from hot winds should be chosen, and low positions, where the effect of frost would be severe, avoided. Spring is the best time to plant if a good supply of water is available; otherwise, autumn is most suitable. Plants from pots may be set out at any time, excepting the cold winter months. The plants need careful watering until established, and may be mulched during summer with leaf mould or some such material. A mulch of fermenting manure would probably kill the plants. Azaleas require little pruning, shortening gross shoots to maintain the balance of the plant being all that is needed

usually, and thinning when in bloom, if the plants are becoming too thick and crowded. Azaleas are suitable plants for pot culture, requiring only moderate pot room. The best potting soil is a peaty, sandy, soil, and especial care should be taken to make the drainage perfect. They should not be repotted until the pots are full of roots, and then should be transferred to pots one or two sizes larger. Very firm potting is necessary: the soil should be rammed firmly around the ball with a blunt stick. Repotting should be done when the flowering season is past, and young growth commences in Spring.

Thrips and green fly are the insect enemies of the Azalea. An occasional spraying with "nikoteen" will keep the plants free from both.



"NIOBE."—DOUBLE, PURE WHITE.

Plants in pots should be frequently syringed or sprayed, especially after being repotted. Free use of the syringe or hose will keep the plants clean and healthy.

Azaleas may be propagated from cuttings and layers, but the amateur grower would not be likely to succeed without glass, frames and other facilities. The plants are fairly cheap now, indeed very cheap, considering the time and attention necessary to produce them. The principal varieties are as follow:—

Single—Fielder's White, La Victoire, Ella, Charles de Buck, Pluto, Charmer, Dandyana, Duc de Nassau, Eugene Mazil, Apollon, Marquis of Lorne, Stella. Double—Niobe, Princess of Wales, Deutche Perle (the

best double white for floral work), Phœbus, Baron N. de Rothschild, Souvenir de Prince Albert, President R. de Smit, Empress of India, Veronica, Daphne, Fortiana, Jubilee, A. Borsig.

There are also a number of small flowered kinds, hybrids, from *a. amœna*, that are very useful for floral work and decoration.

Flower Garden.

The work of pulverizing the surface is the most important phase of gardening this month. The hoe should be kept going as much as possible, even if no weeds are present, especially after rain and as the surface is drying. In addition to the benefits secured to the plants by aerating the soil and conserving moisture, the work of maintenance is made much easier and generally more of a pleasure than a toil. All plants that require staking should be attended to as need arises. At best it is difficult, and the result more or less unsightly, to have to pull and tie plants upright that have been allowed to become set in a recumbent position. Growing shoots on climbing plants should be tied in the direction required to fill space, and not be permitted to cross and interlace each other. Rapid growing and shy blooming plants should be trained more to the horizontal than the upright.

Summer flowering annuals should be thinned out if too crowded, and the plants kept growing as freely as possible. A mulch of stable manure or a watering with liquid manure will increase the size of the plants and enable them to produce a much greater quantity of, and far finer, flowers in due season. Asters, Phlox Drummondii, and other free-growing annuals should have plenty of room allowed each plant, if planted in clumps, from 6 to 9 inches between each plant. The season of flowering will be prolonged by cutting the flowers regularly in the case of many kinds. Corms of Gladiola may be planted. It is not advisable to keep bulbs, &c., out of the ground too long after they begin to shoot. A deep well-enriched soil is necessary to produce fine flowers. In case of early-planted corms, the plants will now require to be staked and liberally watered as the flower spikes appear. Bulbs of Hyacinths and Tulips, and Anemone and Ranunculus Crowns should be lifted after the tops die down.

Tender annuals, *i.e.*, those that will not resist frost, may be sown where they are to bloom, or in pans or boxes for transplanting. A number of kinds are worth growing for their foliage, and may be planted in large borders in proximity to such bright flowering plants as Salvia Bonfire. Some of the Amaranthus have foliage of various shades of yellow, red, and green, and of most variable form.

Attention should be paid to the destruction of insects and fungi. No quarter should be given, and no time lost in making the attack. But it is necessary to know how and with what to spray or wash the plants, and every reader of this *Journal* should, with that end in view, procure a copy of the *Pests and Diseases Chart* issued gratis by the Department.

Kitchen Garden.

Keeping the young growing crops free from weeds and the soil in a condition of good moist tilth are most important at present. Frequent hoeings are beneficial to the crops, and prevent weeds, which is far better than permitting them to grow and then destroying them.

As crops of various vegetables are gathered, the land should be dug again and manured in preparation for other crops. Rotation should always be kept in view, and crops as varying in character and needs as possible be sown or planted in succession. This will tend to the production of healthier and better plants, less weeds of certain types, and is the only possible way to cope with many of the insects and diseases which affect vegetables. It is the accumulation of diseases from many crops of a certain type or character, that, under favorable conditions, cause great destruction. Short rotations of various crops grown avert this accumulation in a great measure.

Seeds may be sown of Celery, Cabbage, and other vegetables for winter use; and Peas, Beans, &c., for succession. Plantings may be made from former sowings. Tomatoes should be tied to stakes or trellis as growth advances, and any side branches that occur removed.

HOW TO SAVE THE BEST TOBACCO SEED.

Temple A. J. Smith, Tobacco Expert.

Where it has been proved that a certain type of tobacco thrives best, and gives the best return to the grower, every effort possible should be made to still further improve that type, or, at least, to preserve its best qualities. This can be done most effectually by the selection, for seed purposes, of those plants in the field showing the truest relation to the type desired, and by securing the strongest and best possible seed from each individual plant. In order to do this, it is necessary to study the different qualifications of each type. Having fixed a standard, the grower must keep to it for several years, otherwise his results will not be satisfactory; that is to say, if the same standard is not adhered to in the main, uniformity cannot be secured in the crop, and this is one of the most important features in the production of tobacco leaf.

The following points should be well considered before finally deciding which plants should be retained for seed:—

Purity of type and seed;
The size, shape, and number of leaves on the plant;
Uniformity in type, shape, and ripening;
Size of mid-ribs and veins, and their position in the leaf;
Early ripening and curing properties;
Easy working in regard to suckering, &c.;
Suitability to soil and climate;
Healthy, vigorous seed.

The best method to follow in order to get the purest seed is to grow the seed plants some distance away from the main crop, say, a mile, if possible, and to confine each plot to only one variety. In this way the danger of cross fertilization is avoided. This system, however, can only be carried out on large holdings. Where it is necessary to save seed from plants close to other tobaccoes in the field, special precautions must be taken.

The tobacco plant is self-fertile, and the seed saved from plants self-fertilized has been found more vigorous than from those cross fertilized with the same variety. The means to be taken to prevent hybridization are simple. Just before the flower shows the central cluster of buds, it

should be enclosed with a muslin bag, which is tied round the stem sufficiently tight to prevent insects crawling through, but not so tight as to pinch the stalk. In some cases paper bags are used, but muslin, or some other light cloth covering, is best. All the lower branches on which seed pods form, together with all suckers and the top leaves, should be taken off, and only the main central cluster of buds left on. By so doing, the strength of the plant will not be overtaxed. The smaller quantity of seed produced will be heavier and better, and a larger proportion will germinate. The bag should be removed from time to time on a still day, and suckers taken off, also any pods that are attacked by grubs, and all the small, immature pods. Insects and wind will both be found causes of cross fertilization, and due caution should be taken to prevent their doing damage while the flowers are exposed. When the bag is replaced, it should be tied slightly higher up the stem to allow for the development of the pods. The bag is left on until after the plant is cut and the seed dried out.

About ten of the lower leaves should be left on the plant, and these are removed as they ripen. When the seed pods are fully matured, the stalk should be cut low down, leaving the bag still on, and taken to the shed, where it should be hung well above the floor in a place where the air circulates freely, until sufficiently dry to thresh. Every plant saved for seed should be labelled, its special qualities noted down, and the label left on the stalk until the seed is threshed, when it should be tied on to the bottle in which the seed is placed.

In studying the number of leaves, shape, texture, ribs, &c., much will depend on the purpose for which the tobacco is to be used, and the class and type to which it belongs. If for filler purposes, the texture, vein, and appearance is not considered to the same extent as for wrapper, neither is the shape of so much importance, but a good filler leaf must have good flavour, aroma, and ash, with the minimum amount of mid-rib and good burning quality. For wrapper, which is the higher priced leaf, the shape should be such as to allow of cigar or plug wrappers being cut to the best advantage from each half-width of leaf. The broader the leaf in proportion to length, the more useful and valuable it will be to the manufacturer, as he will be purchasing less mid-rib as compared with the workable portion, and can, therefore, afford to pay more for a wide, than a narrow leaf. The proportion of mid-rib to the blade of the leaf varies from 24 per cent. to 33 per cent., and when it is remembered that the mid-rib is waste tobacco for smoking purposes, the advantage in growing wide leaf is obvious. A leaf that widens rapidly at the butt, and has a round point or tip, will contain much less rib in proportion than the long, narrow leaf with tapering ends. For cigar wrapper especially, the leaf should be silky, of fine texture and elasticity, and good colour. To obtain the fine texture, it is sometimes advisable to grow as many leaves as the plant will comfortably mature. Therefore, the plant that produces a large number of leaves is one that should be saved for seed for wrappper tobacco, provided other qualifications are present. When a plant produces leaves with the lateral ribs close together, or at very uneven distances between, it should be avoided. Sometimes two lateral ribs, or veins, will start together from the mid-rib, branching out as they near the outer edge of the leaf. Such a condition indicates deterioration of seed, or starved growth, and leaves so formed never make the best wrappers.

Plants of the same variety that grow a large number of leaves will often be found growing beside those that produce only a few. It is almost always best to choose the plant that grows the greater number, as by pruning off the top and bottom leaves, greater uniformity can be obtained, and a larger quantity of high-grade leaf secured. Some plants ripen more evenly than others. That is, the leaves all ripen together. This is an advantage, as the cure and sample will be better. Early maturing plants save labour and risk, the differences being very marked. Some plants will ripen in from twelve to sixteen weeks, others taking as long as twenty-two weeks; that is, from the time of transplanting. The saving of a month's work in the field is well worth trying for, while the risk of loss from frost, hail, wind, &c., is minimized. Quickly grown tobacco is always best. Plants that grow the leaves without a frill, or lug, round the stalk or butt of the leaf are more easily suckered and stripped than those that do, and there is less cover for grubs, moths, and thistledown. A fair distance between the leaves on the stalk also makes easier working. Where the leaves are well apart, a good cure is more easily effected, as they are not so bunched together in the shed.

It is not wise to save seed for general purposes from plants that have not been acclimatized, but when a variety has been grown for two years, and has proved suited to soil and climate, seed can be taken. It is important that a healthy season be chosen in which to save a large quantity of seed. If the disease known as Blue Mould has been prevalent in any one season, it is better not to save seed unless necessary. The same remark applies to other diseases, though, fortunately, we in Australia are free from many diseases of tobacco which occur in other parts of the world. One healthy tobacco plant will, if properly treated, provide sufficient seed for the planting of from 25 to 50 acres; consequently, it is not necessary to preserve a large number of plants for the grower's own use. At the some time, when in a good season a number of particularly good plants are available, an extra quantity of seed should be saved: sufficient for seven or eight years' supply is not too much. Heavy seed is better than light, and, for this reason, it is a good plan to sift the seed through a very small sieve made for the purpose. Another method is to blow the light seed away by means of a fan, regulated so as not to be too powerful. Threshing is easily accomplished by rubbing the pods when dry between the hands. After shelling the seed into a dish, it should be sifted, and then placed in jars made air-tight with screw tops, and carefully labelled with the date, name, and characteristics. If stored in a dry situation it will retain vitality for ten years.

To secure the best plants for seed, it is a good custom to save considerably more plants until near the ripening stage, than are ultimately intended to keep. By that time it can be decided which are most true to type, mature early, are uniform, easy to handle, and healthy. Then be sure to try for the smaller quantity of strong, healthy seed by taking off all the top leaves, suckers, and branches. Leave only the central cluster of seed pods, and protect from outside contamination. If every grower would undertake the selection of his own tobacco seed under proper methods, a great improvement in Victorian tobacco leaf would surely result. The time and labour necessary to do this would be very little. It is only natural to presume tobacco can be improved in quality, quantity, and value, just as maize, wheat, and potatoes have benefited by the same attention, more especially as it has been proved that individual tobacco plants are most consistent in handing down their special characteristics.

THE PROCLAIMED PLANTS OF VICTORIA.

(*Continued from page* 558.)

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.

The Water Hyacinth.

Eichhornia speciosa Kunth; syn. Pontederia crassipes, Mart. (*Pontederiaceæ.*)

A floating plant, the roots having a cap-like covering at the extremity. Stems very short, the leaves almost entirely immersed, roundish, but very variable in shape; leaf-stalks, long or short, more or less inflated below the middle, with a sheathing scale at the base. Flowering axis from 6 to 12 inches long, with several sheathing bracts. Flowers, 6 to 12, with a curved tube, pale-purple; the five lower segments nearly equal, the upper one larger, and marked with a yellow spot in a cloud of blue. Stamens inserted within the tube, 3 long, 3 short, filaments lilac, with numerous stalked glands. Anthers oblong; ovary tapering upwards into the style, stigma globular. It is a native of tropical South America. The flowers are very beautiful, and, as it flowers freely, it has been widely cultivated.

The following extract from Bulletin No. 14 (1891), issued by the U.S.A. Department of Agriculture, plainly shows the danger of allowing this plant to spread:—"Along the St. John's River the margins are lined on each side by a broad belt of plants, and all coves, marshes, and small tributary creeks are entirely covered. Sometimes the main channel of the river becomes blocked by masses of the plant. The same conditions also prevail in Florida and other districts." Proclaimed under the Thistle Act for the whole State.—October, 1901.

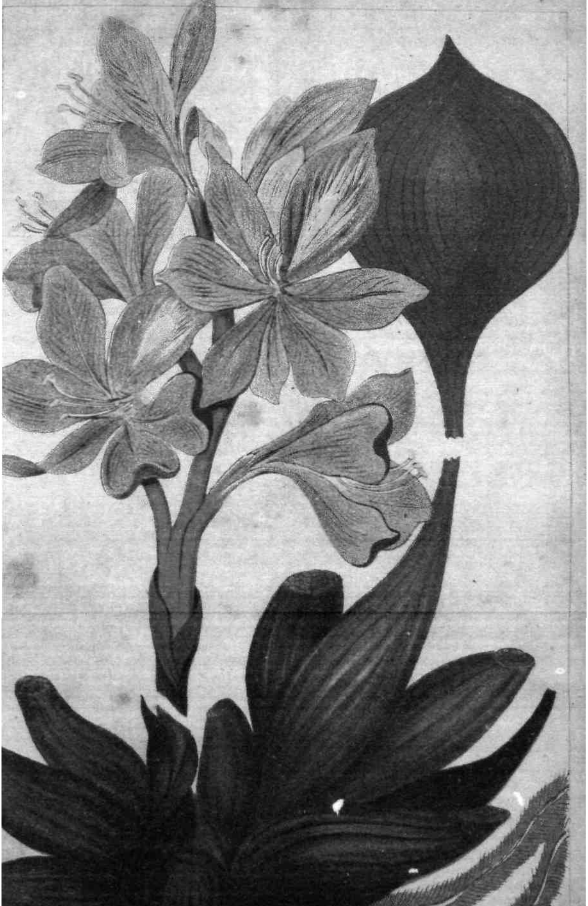
(*To be continued.*)

THE WEEDS OF LAKE WENDOUREE.

Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist and Professor of Botany in the University of Melbourne.

Great difficulty has been experienced by the Ballarat Council in keeping the luxuriant growth of the weeds of Lake Wendouree in check, and considerable expense has been incurred by them for this purpose. Numerous abortive attempts have been made in the past to permanently clear the lake, and much money spent, without achieving any permanent improvement. Recently the Council imported a fen reed-cutter from Bedford. This is a small stern-wheel paddle-boat driven by a petrol motor, and trailing on each side an iron rod, which can be raised and lowered. At the end of the rods a pair of strong cutting blades is fixed so as to form a V with the apex forwards. The cutting edge of each blade is like that of a bread-saw, and the knives are drawn after the boat in a series of jerks by the aid of a crank attachment to the connecting rod, the knives being kept a few inches off the bottom. The cutting goes on during six months of the summer, and at such times and in such places as to insure that the cut

PLATE 6



weeds, which mostly float at the surface, will be driven to the side by the wind, so that they can be drawn ashore. In this way a certain amount of the area has been kept reasonably free of weeds during the past year, but only by a total expenditure of approximately £400 per annum, in which no allowance is made for the time of officials taken from other work.

At the request of the Council, a visit of inspection was made in August, 1906, to determine whether any means could be devised of keeping under the weeds at small cost. The more troublesome weeds growing in the lake are all flowering plants, of which specimens of the following were obtained. Only one specimen (*Myriophyllum elatinoides*) was found in flower, so that the naming is in certain cases subject to revision.

Flowering Plants.

Myriophyllum elatinoides Gaud.—Long stems, feathery leaves, spikes of minute flowers with entire small but broad leaves projecting above the water. This plant is easily kept under by cutting, and frequent cutting will ultimately practically suppress it.

Potamogeton obtusifolius Mert and Koch.—Grass-like plant, with slender creeping stems, and erect ones with long, rather narrow, thin leaves. After cutting the erect stem, the remaining basal portions, which contain a good deal of stored food, shoot at every joint, and in summer time very rapidly increase to the original size, and may even be denser than before. It can be kept under by dredging or raking off the bottom. This plant was first noticed in quantity in 1904, four years after the waste water from the reservoir was turned in, and since then has spread rapidly. Specimens of the plant were, however, sent to the National Herbarium from Lake Wendouree by Spence, in 1883. *Potamogeton natans* has oval leaves floating on the surface.

Lepilaena Preissii F. v. M. — A somewhat grass-like plant, which can be kept under by dredging or by raking mud over it. This plant and another more grass-like one appear to be diminishing. The latter plant resembles in vegetative characters *Ruppia maritama*, although it seems hardly likely to find this maritime plant so far inland in a fresh water lake, even if the water of the lake had been brackish before the supply of fresh water was increased.

Triglochin procera R. Br.—A large plant with rather lily-like leaves. A large quantity of food is stored up in the stem and roots, buried in the mud, so that frequent cutting is required before the plant is exhausted.

Vallisneria spiralis L.—In leaf this plant slightly resembles the former one, but the leaf is thinner, a darker green, less rigid, and does not project above the water, while the female flowers are on long spirally-coiled stalks. Frequent cutting soon exhausts the plant.

Villarsia reniformis R. Br.—Floating, more or less kidney-shaped leaves on long stalks. Easily kept under by cutting.

Typha augustifolia L. Reed Mace.—One of the largest of the reeds, all of which can be kept under by frequent cutting as close to the base as possible. It is worthy of note that in the fen districts of England reed-cutting is a profitable industry.

The non-flowering plants included *Azolla* (floating on the surface), *Spirogyra* (floating beneath the surface), and *Nitella* (growing from the bottom). The former plant takes the place of the Duckweed (*Lemna*) of an English pond, and is easily removed when driven to one side by the wind. The two latter plants are very sensitive to poisons. Thus, the

addition in summer time of 10 tons of crude sulphate of copper, at a cost of rather more than £150, would kill out these plants without affecting the other living organisms to any appreciable extent; but they are, unfortunately, the least troublesome weeds of all.

The fish of the lake are mainly carp and trout. They are stated to be abundant, but the weeds render fishing difficult. The lake appeared to be remarkably deficient in fresh water snails. These, when abundant, aid in keeping down the weeds, but are hardly likely to be of much service under the present conditions. It might, however, be worth while to introduce such large forms as *Paludina vivipara*, if not already present.

Points of great importance are the fluctuations of level, the amount and character of the water supply, the nature of the bottom, and whether the water is put to any use or not. In regard to the last-named item, the lake is held by the Council under a Crown grant, one condition of which is that the lake is to be kept in such a condition as to be available for temporary domestic supply to Ballarat city. The use of the water of the lake in summer time, with the bottom in its present condition, would be fraught with the utmost danger to health. At present, however, the overflow is put to no use, nor is any water drawn from the lake for domestic or other purposes.

The lake is fed partly from surface drainage and partly from the overflow from the waterworks. A sample of the latter (August 6, 1906) was very clear, left no appreciable residue on filtering, and contained 0.091 of a gram of dissolved solids per litre, including a little lime. The surface drainage water was slightly turbid, left a very slight residue on filtering, and contained 0.25 of a gram of dissolved solids per litre, in which hardly any lime was present. The clear surface water from Lake Wendouree left no residue on filtering, and contained 0.28 of a gram of dissolved solids, of which lime formed a greater part than in either of the other two residues. Since this is at a time when evaporation is reduced to a minimum, and when the overflow is greater than the inflow from the waterworks, it is evident that the water in the lake dissolves soluble constituents, partly lime, from its bed. Possibly lime may have been added at some past time, but it is evident that there is no hope of reducing the weeds by mineral starvation, by allowing only the purest water to enter the lake.

The bottom of the lake is composed of rock and boulders, covered by 3 to 8 inches or more of black mud. In the past several deep quarry-holes, up to 17 feet in depth, were excavated. These were naturally free from weeds, but are being filled up, and will soon be as subject to the spread of weeds as the rest of the lake. The denser black mud contained 18 to 21 per cent. of organic matter (dry weights), while the percentage in the soft, rich ooze ran up to as much as 45 per cent. A bottom of this character is favorable to weeds, and unfavorable to good fishing.

Another factor favouring the weeds is the maintenance of a more constant level since 1900, when the Gong-gong pipe was first turned into the lake. Before that the level often sank to 1 ft. 6 in. or less, whereas since then the summer depth is rarely less than 3 feet. In this way the natural check formerly imposed by the partial drying up of the lake in summer has been removed to a very large extent. From September, 1903, to December, 1904, the level of the lake never fell below 4 ft. 6 in. deep, and it was precisely at this time that the *Potamogeton* first became so troublesome. The rapidity with which evaporation can lower the level of the lake is shown by the fact that during January and February, 1906,

the level fell nearly ¼ inch daily, the total loss of water being 170,000,000 gallons, or rather more than the total overflow per annum.

The Problem of Weed-suppression.

The introduction of various animals, by restoring the balance of nature is often of service, but would be of little or no use here. Ducks and similar water fowl aid in several ways in keeping under certain water weeds, but at the same time by their devouring water snails and herbivorous larvæ, this effect is largely neutralized.

The cutting machine will keep under, or even suppress by frequent cutting, all those weeds which project to any extent above the water, but is very much less effective in the case of those which grow completely submerged, and these are precisely the weeds which are most troublesome at present. Cutting such forms acts in precisely the same way as mowing a lawn—the herbage becomes shorter, but thicker and closer.

Poisons.—The use of any such poisons as copper, mercurial, or arsenical salts, while extremely costly, would also involve the danger of so poisoning the lake by precipitation and surface adsorption that it might become incapable of supporting fish for some years. A method of treatment which would avoid this danger would be to allow the level of the lake to fall as low as possible, net and transfer the larger fish to a pond, and then acidify the water with sulphuric acid, followed a month or so afterwards by the addition of lime. This treatment would, however, make the lake extremely offensive for several months, the treatment would need repeating within three or four years, and would be costly. Thus sulphuric acid is fatal to water-plants in a concentration (by weight) of 0.05 per cent., which is approximately equivalent to one gallon of commercial sulphuric acid, at 2s. per gallon, in 3,000 gallons of water. At a depth of 2 ft. 6 in. the lake would contain approximately 300,000,000 gallons, and to poison this efficiently 100,000 gallons, or £10,000 worth, of sulphuric acid alone would be needed. Methods of poisoning are, in fact, out of the question, since, owing to the large number of weeds in the lake, their varied properties, and the fact that their absorbent surfaces are covered with water, only a general treatment of the above character would be of any avail, and special local treatment would be useless.

Cleansing and deepening form the only ways in which any practical permanent good can be effected. With a clean bottom and deeper water, no trouble would be experienced from weeds. If the lake were allowed to dry in summer time, and a paring plough run over it 4 to 6 inches deep, this surface material would contain all the rooted plants. Its removal would leave the bottom fairly clean, and the material could be used for raising the borders of the lake or for filling purposes elsewhere. Taking the area of the lake as 2½ million square yards, the quantity of material to be removed would be 300,000 cubic yards, and the cost might be £10,000 or £15,000. This seems a prohibitive outlay, and would further involve the disuse of the lake for a year. It must, however, be remembered that the present outlay of £400 per annum represents, at 4 per cent., a capital sum of £10,000, and that in the past over £700 per annum has been spent in suppressing the weeds without achieving any permanent good.

A modified form of treatment which could be spread over a longer period of time, and would not involve the disuse of the lake during operations, would be as follows:—Around the edges of the lake horizontal

dredging might be carried out by means of an arrangement resembling a harvest gleaner, but with the teeth close together, and curved from side to side so as to retain the mud and weed. This could be drawn ashore by a wire rope wound by a traction engine, the dredge starting near the shore, and being carried further and further out by the steamer at each cast, until a distance of 50 to 100 yards was reached. The mud at the edge of the foreshore, when dried and faced with gravel, would form a natural embankment, raising the level of the lake. If the surface drainage from the upper end could be cut off from the lake and drained the other way, the raising of the lake level would not cause any flooding through the present drainage inlets, and the lake would gain by the purer water supply from the reservoir overflow, which is apparently sufficient to fill the lake to its highest level during winter time.

The beauty of the lake might be considerably increased by forming a couple of islands at its centre to take over the protective functions of the existing reed belt, and the material for the islands could be gained by deepening the bottom of the lake. The outline of the island would be formed by a row of piles, about 3 feet apart, and rising a foot above the high-water level. Within these a second slender row would be needed, leaving a space of about 18 inches. This would be filled with fascines of reeds, each containing a 10 to 20-lb. ball of clay or stiff mud. The soft mud and ooze obtained by dredging or pumped into this framework would soon consolidate under the pressure above if the level were kept a foot or so above high-water mark, and ultimately ornamental trees could be planted upon it.

The details and cost of carrying out these suggestions would naturally need to be determined by an engineer, but they afford the only practicable means of effecting any permanent improvement to the lake at a reasonable cost—that is, by cleaning the bottom and increasing the depth. It should be borne in mind that the existing reed-belt in the centre of the lake represents a continual source of infection as regards weeds for the rest of the lake, and that cutting the weeds without drawing them ashore increases the fouling of the bottom.

SEED STANDARDS OF PURITY AND GERMINATION.

F. E. Lee, Agricultural Superintendent.

A not infrequent inquiry made by the farmer is, "Where can I purchase reliable seed?" It is in no sense the duty of the Department of Agriculture to recommend any particular seed merchant, hence a few simple rules for the determination of the purity and vitality of seeds may be of service to persons wishing to make tests for themselves.

There are three characteristics which distinguish good seed from bad, viz.: purity or freedom from foreign matter, vitality or capacity for germinating under favorable conditions, genuineness or trueness to name and type. In order to obtain a representative sample, it will be necessary to take a small portion from at least one-third of the number of

bags, mix the whole thoroughly and weigh off, say, 8 ounces ($\frac{1}{2}$ lb.). Place the seed upon a sheet of glass under which is a piece of light coloured paper, then go over the sample seed by seed with the blade of a pocket knife, and sort out carefully every particle of foreign matter, consisting of pieces of stick, chaff, shrivelled seeds, foreign seeds, dirt, &c. Weigh the cleaned seed again, and the difference between that and the original weight of the sample will give the amount of impurities. For example if the sample originally weighs 8 ozs., and after cleaning weighs $7\frac{1}{2}$ ozs., the impurities will be $6\frac{1}{4}$ per cent. An ordinary letter scale is useful for weighing, or, failing that, put the impurities into a small bottle and ask your local chemist to weigh them. For large seeds like maize, peas, beans, &c., a much larger sample should be selected—even 1 bushel not being too much. The United States Department of Agriculture has established the following standards of purity for farm seeds:—

Beans, cabbage, cauliflower, celery, maize, cowpeas, cucumber, lettuce, millet, oats, onion, peas, pumpkin, radish, tomato, turnip, vetch, wheat, &c.—90 per cent.

Lucerne, beet, clover, sorghum, &c.—98 per cent.

Grass seeds—90 to 95 per cent.

After the purity of the seed is ascertained, its germinative power should be tested. The capacity of seed to germinate is even more important than its freedom from foreign matter. The latter can be roughly found with the eye, but the former is impossible to even guess at. Old seed frequently retains every external appearance of being sound and healthy, whereas when sown, it may give a very poor stand. Fresh seed sometimes may also show a very poor percentage of germination, perhaps from being harvested before thoroughly ripe, or from being bruised in cleaning, or other reasons. Select one hundred seeds (haphazard) and plant them in a box containing moist garden soil. The box should be kept inside the kitchen, not close to the fire, but where the average temperature will be between 70 degrees and 80 degrees Fah. The soil in the box should be moistened from time to time, but must not be kept saturated, or some of the seeds will rot and spoil the test. An alternative method is to place 100 seeds between the folds of a moistened flannel cloth, the whole being kept between two soup plates, one inverted on the other. This latter method allows frequent inspection. As soon as the seeds have germinated, they should be removed with a small forceps or a pin, counted and thrown away. Give the seeds which appear slow in germinating every chance before deciding that they are barren. The number of ungerminated seeds will be the percentage of infertile ones in the whole bulk. It is safer and more accurate to carry out these small germination tests in duplicate, or even triplicate, so that an average may be taken. The germination standards adopted in the United States are shown on the following page. While first-class seeds usually surpass these standards, it may be said that seeds which fall as much as 10 per cent. below them need not be rejected as bad.

Before leaving the subject, a word may be said as to the importance of storing grain for seed purposes in dry places away from vermin-infested barns. Mice, weevils, and other vermin do their work in such a silent manner, that unless the seed is continually looked over, it may have

seriously depreciated when the time comes for use. The advantage of selecting plump seeds by means of mechanical graders or hand sieves, furnishes scope for an article by itself, but it may be briefly mentioned as being one of the several factors which, assisted by thorough cultivation and intelligent fertilization, insure the production of maximum crops.

Seed.	Fair percentage of Germination.	Seed.	Fair percentage of Germination.
Beans	95	Cowpeas	90
Cabbage	95	Onion	85
Carrot	85	Rape	95
Cauliflower	85	Turnip	95
Alsyke Clover	80	Cucumber	90
Oats	90	Grasses	50 to 90
Pumpkin	90	Sorghum	90
Tomato	90	Lettuce...	90
Red Clover	90	Millet	90
Crimson Clover	95	Peas	98
White Clover	80	Sunflower	90
Maize	90	Wheat	95

INTER-STATE STOCK CONFERENCE.

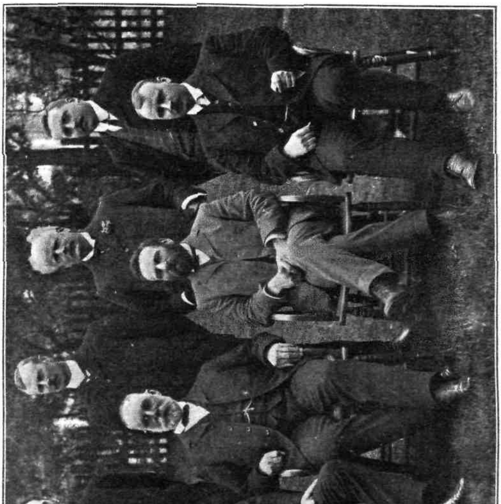
Held at the Public Offices, Melbourne, from 28th August to 4th September, 1906.

Minutes of Proceedings.

The representatives to the Conference in attendance were Messrs. T. A. Tabart, Chief Inspector of Stock (Tasmania); J. P. Orr, Deputy Chief Inspector of Stock, A. H. Cory, M.R.C.V.S., Government Veterinary Surgeon (Queensland); J. D. Stewart, M.R.C.V.S., Government Veterinary Surgeon (New South Wales); R. J. Needham, Chief Inspector of Stock (South Australia); J. R. Weir, Chief Inspector of Stock, and S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer (Victoria). Mr. J. C. Hatton, of the Department of Agriculture (Victoria), was appointed secretary.

The representatives were formally received and welcomed by the Minister of Agriculture (the Hon. Geo. Swinburne, M.L.A.), and by the Director of Agriculture (Dr. Cherry).

Mr. Swinburne said that he had much pleasure in welcoming the representatives to their work of taking part in a Conference which might have very far-reaching effects. They constituted but a small body of men, but a great deal of benefit might be derived from their deliberations, considering the importance of the subject which they had in hand. The main problem to be tackled was that of formulating some uniform system



INTER-STATE STOCK CONFERENCE.

Sitting—Messrs. J. P. O—. (Q.), R. J. Needham (S.A.), T. A. Tabart (T.), Chairman ; T. Cherry, M.D., M.S., Director of Agriculture (V.) ; S. S. Cameron, M.R.C.V.S. (V.).
Standing—Messrs. J. C. Hatton (Secretary), J. R. Weir (V.), J. D. Stewart, M.R.C.V.S. (N.S.W.) ; J. B. Lincolne, Government Shorthand Writer ; A. H. Cory, M.R.C.V.S. (Q.).

of inspection throughout the States. At the Premiers' Conference in Sydney it was felt that it would be a great pity to continue the antagonism between the States in border inspection, and that some uniformity could be established in a truly Federal spirit. It was, therefore, to be hoped that from this Conference would be evolved some good uniform system that could be adopted in every State. Up till now the various States had not seemed to have trusted each other. Victoria did not trust New South Wales, thinking that the New South Wales system of inspection was not equal to the Victorian, and consequently had insisted on having border inspectors. It would, however, be better if all the States were of the same mind, and had confidence in each other—would have such trust in each other's certificates that cattle could proceed from one State to another without that police inspection which was hardly the right thing between Federated States. Victoria was quite willing to follow the movement in this regard, which had been initiated by New South Wales, as long as she was sure that she could trust the certificates of inspectors of other States as being certificates equal to her own, and that the Departments concerned immediately notified each other what was going on with regard to diseases in stock in their own States. It was certainly the duty of these Departments to protect other States, by giving notification of outbreaks of diseases in stock. If we found the presence of anthrax in any district of Victoria, we would immediately telegraph the fact to New South Wales, South Australia, and the other States. The same thing should be done by New South Wales and the other States. A feeling of confidence in each other in that respect should be established; and he believed that if the Conference formulated a system of inspection that could be adopted by each State, and under which each Government could trust the others, and under which each State department would be a sort of intelligence bureau for the others, as to all that was going on with regard to diseases in stock, we would be able to do away with an expensive system of inspection, and have clear border traffic. Notice had recently been given in the Victorian Parliament for the establishment of municipal sheep dips, with a view to compelling all farmers to have their sheep dipped. In Victoria, we had initiated a system in the Dairy and Milk Supervision Act which would be very far-reaching as far as cows were concerned, and which he thought was far in advance of anything of the kind done in most of the States. He concluded by saying that he would be only too glad to do anything in his power for the information or pleasure of the delegates.

Mr. T. A. Tabart (T.) was elected chairman, and in the name of the Conference he thanked Mr. Swinburne for his cordial welcome. He also returned thanks for the honour of his election to preside, and referred to his presidency over the Conference of 1892 in New Zealand, noting, with regret, the absence of Messrs. Bruce, Curr, Pentland, and Stirling, all dead colleagues, and of Messrs. Gordon and Valentine, retired. All these gentlemen had done excellent work in their time for the Australian States, and doubtless their successors would do likewise.

Dr. Cherry addressed the representatives, indicating the view of the Victorian Department of Agriculture with respect to the inspection of and methods adopted for the prevention and eradication of infectious diseases in stock. He trusted that the result of the deliberations of the Conference would be a definite policy, which would be adopted by the various

States of the Commonwealth, and that that policy would be for the advancement of stock interests throughout Australia.

The following Agenda paper was agreed to:—

1. Existing system of internal inspection of stock in each State.
2. Inter-State restrictions and border inspection relating to such communicable diseases of stock as—(*a*) tick; (*b*) anthrax; (*c*) pleuro-pneumonia; (*d*) swine fever; (*e*) tuberculosis; (*f*) other scheduled diseases; and (*g*) non-scheduled diseases.
3. Existing methods adopted to prevent the introduction of diseases from outside Australasia.
4. Prevention of introduction of foreign diseases.

Messrs. Needham (S.A.), Orr (Q.), Stewart (N.S.W.), and Weir (V.) explained to the Conference the existing methods of inspection and control in relation to infectious animal diseases in their respective States.

After considerable discussion, the following motion was proposed by Mr. Cameron (V.), seconded by Mr. Stewart (N.S.W.), supported by Mr. Weir (V.), and other delegates, and carried unanimously:—

That, having by responsible statements by delegates and debate thereon become familiarized with the practice of internal stock inspection in the different States, this Conference is of opinion that it is eminently desirable, as it appears also to be feasible and practicable, that a system of Inter-State exchange of reports of outbreaks of anthrax, cattle tick infestation, pleuro-pneumonia, swine fever, and any exotic communicable animal disease be inaugurated whereby all the other States may be at once notified of the occurrence of such outbreak in any State. This for the reason that while it appears to be impracticable to bring about uniformity in the system of internal stock inspection under existing legislation of the States; and because of the various local geographical and other conditions prevailing in the different States, such a system of Inter-State exchange of reports would tend to facilitate modification of the existing system of Inter-State restrictions and border inspection of stock.

Mr. Orr (Q.) made a statement indicating the measures taken in his State for the prevention of the spread of tick to uninfested areas. He said every effort had been made to stop its progress. The first line was established somewhere south of Mackay; the next south of Rockhampton; then it was grappled with at Bundaberg, and afterwards as far south as Brisbane. His Department did not throw up the sponge at the Logan River district, or until the disease had advanced as far south as the Tweed. Total prohibition without dipping was adopted. He admitted that at that time the Department did not have the desired number of inspectors available. Total prohibition had been a failure in so far as its enforcement involved a larger sum of money than could possibly be obtained. The practice now was to subject all stock leaving an infected area to two dippings prior to entering a buffer area, which is clean country. It was required that New South Wales should accept Queensland stock from the buffer areas on the certificate of the latter State's inspector, and relax the restrictions with respect to prohibition and detention of stock. He mentioned that at the crossings where New South Wales established total prohibition, the ticks got into their territory, but where Queensland cattle were allowed ingress after regular dipping no ticks appeared.

Mr. Stewart (N.S.W.).—The restrictions were due to Queensland's failure to check the onslaught, although he was prepared to admit that greater and more effective precautions are now being taken, but thought that improvement was, in a measure, due to the action of New South Wales. On the 8th March, 1904, the Chief Inspector of Stock (N.S.W.)

called attention to the fact that cattle on the Queensland side of the fence were carrying ticks, and suggested that the Queensland Stock Department should be asked whether, in the event of being given the use of New South Wales dips free of charge, they would, or could, compel owners of stock to dip at stated intervals. This, however, Queensland was unable to do. The crux of the whole position was this: Queensland must either protect New South Wales, or that State must protect itself. At the same time he desired to say that during the last year or two Queensland had made commendable efforts to assist his State, and received a promise from New South Wales that with increased vigilance they should obtain corresponding relaxation of existing restrictions. Personally, he did not consider two dippings sufficient to absolutely cleanse an animal. His opinion was based on the result of personal observation in experiments carried out during the tick onslaught. The first dipping was not considered of any value to New South Wales as it took place in an infected area. As an additional precaution, his State had always maintained that there should be a third dipping after reaching an uninfected area. Without committing his State, he, personally, would be in favour of accepting a further dipping. That was to say, two dippings before leaving the infected area, and another on reaching clean country. If this were done, he was inclined to think New South Wales would accept it, and give Queensland a reasonable relaxation of present restrictions. The only assurance he could give was that the degree of relaxation would depend on what measures the Queensland Government decided to adopt for the eradication of tick. He would be prepared to recommend acceptance of the conditions he had stated. During the discussion he had been asked for information as to the result of the second examination of stock in the Tweed River district. He had referred the inquiry to the Chief Inspector of Stock at Sydney, from whom the following reply had just come to hand: "Inspector telegraphs this morning, 'Muster of all stock, including 34 horses. All clean.' I consider this satisfactory."

As the outcome of the discussion:—

Mr. Needham (S.A.) moved:—

That this Conference is satisfied with the methods adopted by New South Wales in preventing the spread of tick infestation from Queensland, and agrees that, contingent on increased precautions in certain directions to be agreed on between the two States, reasonable decrease of the period of detention in buffer areas may be safely allowed.

Seconded by Mr. Cameron (V.), and carried unanimously.

Mr. Orr (Q.) moved:—

That this Conference is of opinion that the measures adopted by New South Wales in regard to the introduction of working horses across the Queensland border are efficient and an adequate protection for the other States without the imposition of further restrictions by such States.

Seconded by Mr. Needham (S.A.), and carried unanimously.

Mr. Orr (Q.) then submitted the following further proposition:—

That in the opinion of this Conference, Queensland working horses and dogs should be admitted into Victoria by sea on similar conditions to those imposed by New South Wales.

It was seconded by Mr. Needham (S.A.), and, after considerable discussion, voted on as follows:—

Ayes: Messrs. Cory (Q.), Needham (S.A.), Orr (Q.), Stewart (N.S.W.). Noes: Mr. Weir (V).

Mr. Cameron (V.) refrained from voting, and said he thought it unwise to pass any resolution which some of the delegates might be unable to conscientiously recommend to their Ministers for ratification. To meet that probable difficulty, he would move—

That in the event of the previous recommendation not proving acceptable to any of the States the following alternative recommendation should be substituted, namely :—That this Conference is of opinion that the measures adopted by New South Wales with respect to the introduction of working horses and dogs by sea have been proved to be effective; and that if the remaining States desire the introduction of working horses and dogs from Queensland by sea, New South Wales measures are recommended as adequate.

As this was not seconded, Mr. Cameron submitted the following motion :—

That in the event of the previous recommendation not proving acceptable to any one of the States the following alternative recommendation be substituted, namely :—That this Conference recommend that Victoria might accept *bonâ fide* working horses and dogs from Queensland by sea which have been subjected to the preventive measures directed against tick invasion in New South Wales; and that such working horses and dogs be landed in Victoria without further restrictions.

This was seconded by Mr. Weir (V.), and carried. Mr. Stewart (N.S.W.) refrained from voting.

Anthrax, the next subject on the agenda paper, was then brought under discussion.

The Chairman stated that Tasmania had been subjected to four outbreaks. They were promptly reported, and successfully grappled with by qualified officers.

Mr. Orr (Q.) said Queensland had no cases reported or ascertained. His State prohibited the importation of Indian bonemeal.

Mr. Stewart (N.S.W.) considered this the most important subject of the Conference, inasmuch as it was the principal means of bringing it about. On 30th October, 1889, regulations were issued by the Victorian Government to control the import of sheep from New South Wales. On 8th October, 1890, the word "sheep" was repealed, and "stock" substituted, and provision made that sheep intended for export should not be vaccinated. These restrictions were subsequently modified, inasmuch as they were in force from 1st October to 31st March only, and applied to sheep coming from a certain area of New South Wales only, which, he understood, was defined by lines drawn direct north from Wodonga on the east, and from Cobram on the west. How far they extend north had not yet been officially defined. New South Wales and Victoria were practically in the same position as regards anthrax; consequently there was no justification for Victoria continuing those restrictive regulations, particularly as they advertised that the southern portions of his State were anthrax-infected. Not only was that objectionable, but it had a depreciating effect on property as well as stock. The restrictions prevented stock-owners from taking full advantage of the Victorian markets, and caused others, whose pastures are clean, to indulge in vaccination. The New South Wales Stock Diseases Act had been in force against anthrax since 23rd February, 1904. Since that date there had been a considerable number of sheep vaccinated. The benefit of vaccination was now so generally recognised that owners of property adopted it as a safeguard. Vaccination had, apparently, been very successful in the Riverina district. No outbreak had been reported from there for some considerable time. That being so, it appeared to him that

Victoria should accept stock from New South Wales under the same conditions as New South Wales accepted them from Victoria, so far as anthrax was concerned; that was, on the certificate of the Inspector of Stock for the district. As a matter of fact, his State was in a better position than Victoria in this matter, as New South Wales stock could not travel without a permit. Their Stock Act provided a complete and efficient system of branding, and enabled the movements of stock to be traced right through the State. This system was not in operation in Victoria.

In reply to Mr. Weir (V.), Mr. Stewart stated that he had not heard of any outbreak of anthrax traceable to stock admitted from Victoria.

A general discussion followed, and resulted in the following resolution then being unanimously agreed to on the motion of Mr. Stewart (N.S.W.), seconded by Mr. Weir (V.):—

That in view of the fact that anthrax was now a notifiable disease in New South Wales, and that provision was made for compulsory vaccination when deemed necessary, the passage of stock from one State to another should be governed by the same restrictions, namely, the certifying by an officer of the Stock Departments of the respective States as to the freedom of the stock from anthrax, and, if unvaccinated, also as to the freedom from infection of the holding from which they came and of the route by which they travelled.

Pleuro-Pneumonia was the next subject brought under discussion.

The Chairman explained the regulations existing in Tasmania for the prevention of the introduction of pleuro-pneumonia into that State. Prior to 1893, prohibition was in force. In that year 130 days' quarantining was substituted. Not even under exceptional circumstances would he be prepared to recommend a shorter quarantine.

Mr. Cameron (V.) said he would like recorded in the proceedings of the Conference one or two statements, based upon sound and scientific knowledge, which would appear to show that the position taken up by Tasmania with regard to pleuro-pneumonia, and their imposition of quarantine for this disease, was not quite reasonable. He took it that the whole *raison d'être* of the Tasmanian period of quarantine was that it was a fact that a recovered beast may have a lesion in its lung encysted, and, while encysted, absolutely free from danger; but may at any time, from some lung trouble, become freed from its encystment, and, therefore, infective both to that animal and other animals. It was a perfectly sound scientific statement of fact, but there was no limit to the period of danger. It was not 130 days; it was not 130 months. So long as that animal lived, so long did that danger exist. The logical position was this: Total prohibition or a period of quarantine based upon our absolute knowledge of the incubation period of the disease, which never was beyond 90 days, seldom beyond 60, and usually within 30. So that it appeared to him the reasonable course to take, in case total prohibition was not adopted, would be to reduce the period of quarantine to—he should say—60 days; but, at all events, to not more than 90 days. This would tend to facilitate Inter-State trade, and would fully meet all the requirements of safety. He was not putting it that Tasmania should do this, or that she was not right in maintaining a perfectly clean sea-girt State; but that stock should be admitted on conditions based upon knowledge of pleuro-pneumonia, which is now almost absolute. He did not know whether, at a later stage, it would be desirable or competent for the Conference to pass a resolution in the direction he had indicated; but he did want this Conference to know what the scientific, safe, and logical position was.

Mr. Weir (V.) wished to point out that since the 130 days' regulation had been in force, cattle had been admitted from other countries, where pleuro-pneumonia was known to exist, without further restriction than 40 days.

Mr. Stewart (N.S.W.).—It seemed to him that the strongest argument for the reduction in the period of quarantine for Australian cattle was in the fact that, during the 130 days' period, no case of pleuro-pneumonia had been detected in the animals while in quarantine. It, therefore, appeared to be more due to other restrictions governing the importation than to the quarantine. In his opinion, complete protection could only be obtained by absolute prohibition.

Mr. Needham (S.A.) would like to express sympathy with Tasmania. He thought, if any of the other States were in the same position, they would be very careful about introducing Australian cattle into their State. He did not think it was fair to ask Tasmania to admit Australian cattle on the same period of quarantine as they did cattle from the United Kingdom. There was a far greater risk. He would regret to see a resolution passed by the Conference asking for a great reduction in the period of quarantine.

Mr. Orr (Q.) congratulated the Chairman on having no pleuro-pneumonia in Tasmania, and hoped that he would never have it. The aim of the Conference, however, was not to see how stock could be kept out, but, as far as possible, how stock could be admitted to other States with the least possible danger. It has been suggested that the 130 days should be reduced to something which might be considered satisfactory. Mr. Cameron has said that 60 days may, and that 90 days would, be sufficient. Tasmania has had this restriction for sixteen years, and had not detected one case, either in or out of quarantine. That was absolute proof that, notwithstanding the introduction of stock from the other States, no affected animal had got in. He thought an interchange of stock should be encouraged consistent with safety.

The Chairman said that, having heard the various arguments, he still held that total prohibition was the safest policy. As he could not get that, he obtained the longest period of quarantine possible. If this Conference were to pass a resolution to force a reduction, and pleuro-pneumonia were afterwards introduced into Tasmania, he would blame the Conference for it. He did not anticipate the Conference would take such action with regard to their quarantine regulations. He thought the present period should remain, otherwise he would strongly urge total prohibition.

Mr. Cameron (V.) said that, under no circumstances, would he be a party to forcing the Chairman's hand, and intended to refrain from submitting a resolution on the matter. Still, although no resolution was passed, he hoped the discussion which had taken place would ultimately result in a more correct attitude being adopted by Tasmania on this question.

The Chairman thanked Mr. Cameron for the position he had taken up. He was always desirous of doing all he could in the interests of commerce, as well as in the interests of the State he represented, and, while he had the honour to hold the position he did, he would always be found working hand in hand with the Stock Departments of the other States. On this question, however, he had been heckled for the last twenty years. There was an agitation now in Tasmania for a reduction of the quarantine, but if a reduction were granted, the responsibility would have to be taken by his Government, and not by him. It would have to be done in opposition to his recommendation.

Mr. Stewart (N.S.W.) stated that the disease was dealt with in New South Wales on parallel lines to anthrax. It was notifiable, and outbreaks were quarantined; infected animals were destroyed, and the remainder inoculated. Inoculation was compulsory, and no stock were allowed to travel unless declared clean.

Mr. Needham (S.A.) said that the conditions existing in his State with regard to this disease were almost identical with those of New South Wales. It had been a notifiable disease for a number of years. They had exactly the same powers to deal with it as New South Wales. They could seize cattle at any suitable place and quarantine them there. At present they had three outbreaks in the State. The cattle had been inoculated. They had only had two outbreaks in dairy herds. The way-bill system was in force.

Mr. Weir (V.) explained at length the quarantine regulations in existence in his State, and the methods of dealing with outbreaks. He admitted that Victoria was at a disadvantage in not having the power of compulsory vaccination. He thought inoculation was the best safeguard they could have in conjunction with quarantine.

After further discussion, the following motion was submitted by Mr. Stewart (N.S.W.):—

> That in the opinion of this Conference it is desirable in the interests of Inter-State stock traffic that Victoria should have legislative power as now exists in New South Wales, Queensland, and South Australia, to enforce protective inoculation for pleuro-pneumonia contagiosa, and vaccination for anthrax of stock recently exposed to risk of infection with these diseases.

It was seconded by Mr. Needham (S.A.), and carried.

Swine Fever.—The outcome of the discussion on this subject was a resolution moved by Mr. Stewart (N.S.W.), and seconded by Mr. Cory (Q.)—

> The importation of swine from one State to another might be permitted by special arrangement, agreed upon by the States concerned.

It was carried unanimously.

Mr. Cory (Q.) submitted the following recommendation:—

> That for administrative purposes it is desirable that the term "swine fever" be taken as including any of the contagious or infectious diseases of swine of a hœmorrhagic septicaemic character now variously termed "swine fever," "swine plague," "hog cholera," and the like.

Seconded by Mr. Cameron (V.), and carried unanimously.

Incidental to Border inspection, Mr. Weir (V.) moved—

> That this Conference, in view of the modification and concessions which they agreed upon as calculated to conduce to the free interchange of stock between the States, and bearing in mind that such facilities should only be granted to stock which are not merely healthy, but that they should not have been in contact with animals suffering from infectious or contagious diseases for some time previously; and as infectious and contagious diseases exist in each of the various States of the Commonwealth, it affirms and recommends that, for the better protection of stock-owners in each of the various States, and with a view to assist in preventing the stealing of stock, that a thorough and rigorous system of Border inspection be pursued, on lines calculated to safeguard the best interests of all parties interested in stock.

This was seconded by Mr. Cameron (V.) *pro formâ,* but, on being put to the vote, was declared lost, the voting being—

For—Mr. Weir (V.). Against—Messrs. Cameron (V.), Cory (Q.), Needham (S.A.), Orr (Q.), and Stewart (N.S.W.).

At the close of the discussion on *Other Scheduled Diseases and Non-Scheduled Diseases*, Mr. Needham (S.A.) moved—

That in the opinion of this Conference Victoria should pass regulations to enforce the compulsory dipping of sheep affected with lice and tick.

Seconded by the Chairman (T.), and carried.

The last two subjects on the agenda paper, viz., *Existing Methods adopted to Prevent the Introduction of Diseases from outside Australasia*, and *Prevention of Introduction of Foreign Diseases*, were taken together, at the suggestion of Mr. Cameron (V.), who thought much of the information elicited in the discussion of the latter would have a direct bearing on the former.

Statements were made by delegates from each State, setting forth the regulations for the prevention and methods adopted to prevent the introduction of disease under both these heads.

After discussing the matter in all its details, the following resolutions were unanimously agreed to:—

That it is advisable to hold ships' dogs in a properly-established quarantine while the vessel is in port.

Proposed by Mr. Stewart (N.S.W.), and seconded by Mr. Cameron (V.).

That the system of quarantining imported horses and dogs in private premises as practised by Victoria is regarded as a menace to the animal health of the Commonwealth, and should be immediately abolished, and provision made for the proper quarantining of these animals.

Proposed by Mr. Stewart (N.S.W.), and seconded by Mr. Needham (S.A.).

That in view of the magnitude of the live stock interests in Australia, which interests are threatened by the existence in India, Africa, the Philippines, the Malay States, and the East Indian Islands, including New Guinea, of the following diseases of animals, viz.:—Dourine, surra, rinderpest, South African horse sickness, nagana; and while recognising the value of the precautions now taken, this Conference recommends that importation of stock from those countries should be absolutely prohibited.

Proposed by Mr. Cameron (V.), seconded by Mr. Orr (Q.).

That the admission of cattle into the Commonwealth from countries in the Northern Hemisphere during the months of September, October, November, and December, is not desirable owing to risk of introducing the warble fly.

Proposed by Mr. Stewart (N.S.W.), seconded by Mr. Cameron (V.).

That in the event of rabies not appearing in the United Kingdom during the ensuing twelve months, the advisability of reducing the period of quarantine imposed on dogs imported from the United Kingdom should be considered.

Proposed by Mr. Stewart (N.S.W.), seconded by Mr. Cory (Q.).

That the introduction of an efficient Brands Bill by Victoria, providing for a system dissimilar to those adopted by other States, is strongly recommended.

Proposed by Mr. Needham (S.A), seconded by Mr. Stewart (N.S.W.).

That in the opinion of this Conference foreign vessels should be continuously in Australian waters for three months before being deemed clean.

Proposed by Mr. Weir (V.), seconded by Mr Orr (Q.).

Votes of thanks were, by resolution, accorded to the Chairman (Mr Tabart), to the Secretary (Mr. Hatton), and to the Government shorthand writer (Mr. Lincolne), for their courtesy and attention, and for the satisfactory discharge of their duties.

The Victorian delegates, Messrs. Cameron and Weir, were deputed to convey expressions of thanks and appreciation to the Minister of Agriculture, and to the Director, for the courtesy and hospitality extended to the visiting delegates.

THE ORCHARD.

James Lang, Harcourt.

Fruit trees of all kinds are looking well, and should nothing intervene, heavy crops of fruit will be assured. With good crops of apples, both here and in Tasmania, local prices will be low, and it will therefore be advisable to export to relieve the glut. From advices to hand, prices are expected to rule fairly good in the London market. To get the best price, apples of good quality and best varieties only, properly graded and packed, should be sent. The export expenses are now considerably reduced, the charge from Port Melbourne to London being 5s. 3d. per case. This includes every expense except rail freight from orchard to Port Melbourne; which is a varying amount according to the distance the orchard is from the port, but 5s. 6d. may be taken as a fair average expense per case, from orchards 100 miles from Melbourne. There is room, however, for a considerable reduction in the shipping freight, and it is to be hoped that when the new Commonwealth mail service is in operation, a substantial reduction in the freight on fruit will take place.

November will be a busy month for the orchardist. Cultivating the ground, and spraying will take up most of the time. The splendid rains of last month have put the ground in fine condition for working, and no time should be lost in getting the ground in good tilth for the summer. Spraying for black spot with Bordeaux mixture will require attention, and the peach trees affected with curl in the leaf should also be sprayed with the same mixture. The black aphis on the peach will require looking after, the best remedies being the tobacco wash and the kerosene emulsion. From Canada comes a new method of emulsifying kerosene by mixing 1 lb. lime with 1 quart of kerosene, and adding 20 quarts of water. This requires to be churned continuously for five minutes through a force pump, and it is said that it will keep the kerosene in suspension for several days. A stronger percentage of kerosene could be used for winter spraying by adding half the quantity of water. For the Codlin moth spray the trees with some form of the different arsenical sprays now in use. The spraying should be carefully done so that the whole of the tree is covered, and should be repeated at intervals of ten days. Bandages should be placed on the trees, as by this means grubs that come to maturity can be trapped and destroyed—every grub destroyed means a considerable reduction in future broods.

Newly-planted trees and trees newly grafted should be gone over, and misplaced buds rubbed off. Where old trees have been headed back the young shoots should be thinned out, leaving just sufficient to form fresh branches. Trees just grafted should have the scions well secured to prevent them being blown off by the wind.

CORRECTION.

Through an inadvertence, Mr. R. Sillett was credited with the authorship of the article on "Agricultural Education" which appeared in the October issue. The article in question was written by Mr. F. A. Cronk, President, Agricultural Society, Shepparton, and read by Mr. H. R. Gillett at the Sale Convention of the Chamber of Agriculture.—EDITOR.